

Bibliotheca Herpetologica

A Journal of the History and Bibliography of Herpetology



VOL. 15

International Society for the History and Bibliography of Herpetology

THE SOCIETY

Mission. The ISHBH aims to promote research related to historical herpetology. The Society is devoted to stimulating and advancing the study of the history of the herpetological discipline and its bibliography. We bring together individuals for whom the history and bibliography of herpetology are appealing. We promote the knowledge of these and related topics among members and the general public. The Society was established in 1998. Membership is open to anyone who shares the aims of the Society.

Activities. The society members meet every year, usually in connection with other general herpetological meetings with international participation. Activities include visits to private and public libraries, museums and other places with historical links to the discipline. We organize workshops and sessions in the fields that form parts of larger national or international meetings on herpetology. Our shared lunches adjacent to the yearly business meetings have become popular among members and guests. The Society works to facilitate both formal and informal contacts among members.

Journal. The ISHBH publishes the journal *Bibliotheca Herpetologica*, which is the central pillar of the Society. It contains articles, essays, bibliographies and news of people and events in our field and is a peer-reviewed. The many important contributions make the publication a vital source for bibliographers, historians and taxonomists alike but at the same time the papers are by and large appealing to the layperson in the field.

Beginning with volume 14, ISHBH will adopt an open access publication model. Articles in *Bibliotheca Herpetologica* will be available online as soon as they receive final editorial approval. At the end of the year a hard copy version of *Bibliotheca Herpetologica*, containing all articles published that year, will be printed and distributed to current members.

The name of the journal, up to volume 5(1), was: *International Society for the History and Bibliography of Herpetology Newsletter and Bulletin*.

Membership. The membership fees cover the calendar year. ISHBH membership categories are: Corresponding Membership US\$25/year (open access only plus all other membership benefits), Regular Membership US\$50/year, Institutional Memberships US\$75/year, and Sponsoring US\$75/year. Note that Life Members will retain their status. However, we are no longer offering new Life Memberships. To Join, go to our website <http://www.ishbh.com> and click on the Membership tab.

OFFICERS

Executive Committee Officers:

Chairperson: Aaron Bauer (USA)

Vice-Chairperson: Chris Bell (USA)

Treasurer: Eric Hilton (USA)

Secretary: John Murphy (USA)

Editor: Breck Bartholomew (USA)

Managing Editor & Webmaster: Ralph Tramontano (USA)

Member Without Portfolio: Luis Ceríaco (Portugal)

Other Officers:

Patron of the ISHBH: Ronald Javitch (Canada)

www.ishbh.com

All articles on pp. 1-149 copyrighted and version of record originally published online in 2021 (exact publication date at bottom of first page of each contribution). Hardcopy published December 2021.

FROM THE CHAIRMAN

I am pleased that *Bibliotheca Herpetologica* has completed another volume — the most diverse in the history of the ISHBH. Volume 15 covers a greater range of subjects, time periods, geographical regions, and taxa than ever before, and the manuscripts originated from a broader range of authors than has been typical in the past. The outpouring of support by ISHBH members in the wake of our re-organization in 2020 is reflected in the diversity of manuscripts received, ensuring that the Society can continue to sustain *Bibliotheca Herpetologica* with high quality articles for every interest within the broad limits of our societal scope. I congratulate Breck Bartholomew on the second volume produced under his able editorship. I also thank the authors of the papers themselves and the reviewers, whose efforts benefit the members at large. Our open access model seems to be working well and members, as well as others following the ISHBH, have had new content available on an almost monthly basis. And now, at the end of the year, those whose bibliophilic tendencies compel them to have hard copies, myself included, are finally rewarded with the printed copy! If you have enjoyed this volume of *Bibliotheca Herpetologica*, I encourage you maintain your membership (or become a member if you are not already) and I invite you to make your own contributions in the form of manuscripts on any aspect of herpetological history or bibliography. In 2022 the ISHBH will introduce some exciting new initiatives, to be shared via email and social media, that will be of interest to all members and that will ensure the survival of our society well into the future. As I noted in my message last year, our survival also depends on the recruitment of a more diverse and younger membership and we must all think out-of-the-box to find new ways to promote the ISHBH and its aims to these future members. I wish you all a peaceful and safe end to 2021 and warmest wishes for the coming new year.

Aaron M. Bauer, Chairman
Villanova, Pennsylvania, USA

FROM THE EDITOR

Last year I wrote that I hoped to expand the types of papers published in *Bibliotheca Herpetologica*. As Aaron indicated above, this issue is the most diverse published to date. I sincerely hope this trend continues. However, the diversity in the papers submitted poses some distinct difficulties in finding reviewers. This year, I would like to put a call out for Assistant Editors. The realization of my own limitations has become very apparent while trying to find reviewers for some of the papers included in this issue. How many people are familiar with both classical literature like Dante's *Inferno* and herpetological etymology, or Japonisme in American advertising as it relates to herpetology? These and many other

topics found in this issue make up aspects of herpetological history that are well worth exploring, but challenging for an editor, particularly when only one editor is involved.

I think most members of ISHBH will find multiple papers in this issue interesting. My hope is that you find an unexpected interest in aspects of herpetological history you have never thought about before. Then consider aspects of herpetological history that you know about as a possible publication. Many ISHBH members likely think about and enjoy aspects of herpetology at a very personal level, without many (or any) other people to share their knowledge with. *Bibliotheca Herpetologica*, as you can see from this issue, is a great place to share your knowledge, even if it is esoteric. The International Society for the History and Bibliography of Herpetology is made up of members, from around the world, who share a common interest in the uncommon and little-known aspects of herpetological history and bibliography. That is to say, ISHBH is made up of members who would appreciate the knowledge you have on these topics.

In addition to the papers published in this issue, ISHBH has published interesting submissions on the website, www.ISHBH.com: C. Kenneth Dodd, Jr. has submitted interesting vignettes from old books that he has come across while doing research; Matthius K  chler shared a small portion of his extensive collection of amphibians and reptiles in advertising in a two-part web post titled, "The Serpents in Advertising—from ancient Greece to the 20th century"; and John Murphy continues to highlight plates from various herpetological books. If you missed these web posts you can always sign up for email notifications of any posts to the website by signing up for the ISHBH mailing list on the website. Submissions for the website should be sent to John Murphy. I hope you enjoy this issue. Please remember to renew your ISHBH membership at (www.ISHBH.com). So far submissions for volume 16 suggests that 2022 will be another great year for ISHBH.

Breck Bartholomew, Editor
Salt Lake City, Utah, USA

ABOUT THE COVER

Unpublished draft sketch of the holotype of *Varanus prasinus* by Pieter van Oort from the archives of the Naturalis museum at Leiden. For a transliteration and translation of the pencil writings see the article "On the Discovery and Scientific Description of the Emerald Tree Monitor, *Varanus prasinus* (Schlegel, 1839)" by Hans J. Jacobs and Andr   Koch on page 61. The image can be found online at: https://dh.brill.com/nco/view/nco_NNM001000670/makingsense.



The Herpetological Contributions of Christiaan Karel
Hoffmann (1844–1903) in H. G. Bronn's
Klassen und Ordnungen des Thier-Reichs,
with Remarks on his Treatment
of the Family-Group Names of
Constant Duméril, Gabriel Bibron, and Auguste Duméril.

Jay M. Savage

Department of Biology, San Diego State University, 5500 Campanile Drive,
San Diego, California 92182, USA. savy1@cox.net

INTRODUCTION

In 2015, I discussed the status of family-group names based on the snake generic name *Pareas* Wagler, 1830. For some time, following Dowling and Duellman (1978:112b.3), that genus was referred, variously, to the tribe Paretini or subfamily Paretinae. However, subsequently *Pareas* and related taxa were elevated to family status as Paretidae (e.g. Zaher, 1999). In my earlier paper (Savage, 2015), I demonstrated that Paretini, Paretinae, and Paretidae are unjustified emendations and concluded that the correct name for the family is Pareidae Romer, 1956. Recently, while researching another project (Savage, 2020), I discovered that Wallach, Williams, and Boundy (2014: xi) used another apparently incorrect spelling (Pareatidae) of the family name and credited that spelling to C. K. Hoffmann, 1890.

C. K. HOFFMANN AND HIS MAJOR WORKS ON
SYSTEMATIC HERPETOLOGY IN H. G. BRONN'S
KLASSEN UND ORDNUNGEN DES THIER-REICHS

Christiaan Karel Hoffmann (1844–1903) was a distinguished Dutch zoologist and morphologist (Fig. 1). He was a long-time Professor of Zoology and Comparative Anatomy (1874–1903), and *Rector Magnificus* (1890–91) at Leiden University (Adler, 2007). He published many significant monographs on anatomy, especially osteology and major organ systems, and the theory of development, especially of vertebrates.

His most important systematic works are a comprehensive series of volumes in H. G. Bronn's *Klassen und Ordnungen des Thier-Reichs, wissenschaftlich dargestellt in Wort und Bild*. Sechster [6] Band. WIRBELTHIERE. Zweite [2] Abtheilung (Fig. 2). Hoffmann's coverage includes: Band 6, Abtheilung 2 (AMPHIBIEN), (see Figs. 3–5 and the Appen-

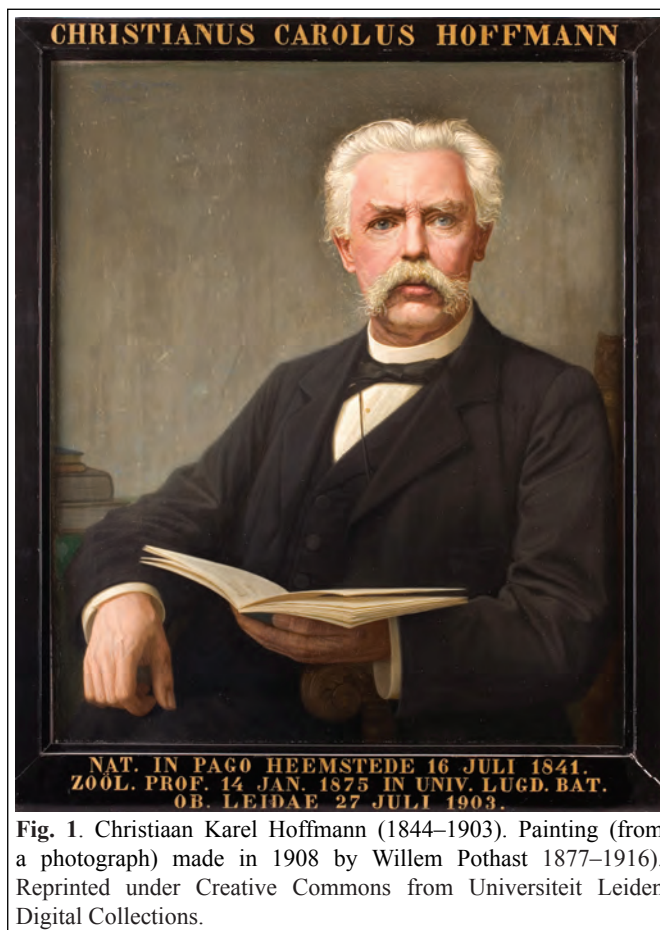


Fig. 1. Christiaan Karel Hoffmann (1844–1903). Painting (from a photograph) made in 1908 by Willem Pothast 1877–1916). Reprinted under Creative Commons from Universiteit Leiden Digital Collections.

dix), published in 1873–1878; Band 6, Abtheilung 3 (REPTILIEN. I. Schildkröten), (see Figs. 6–8 and the Appendix), published in 1878; Band 6, Abtheilung 3 (REPTILIEN. II. Eidechsen und Wasserechsen), (see Figs. 9–11 and the Appendix), published in 1890; Band 6, Abtheilung 3 (REP-

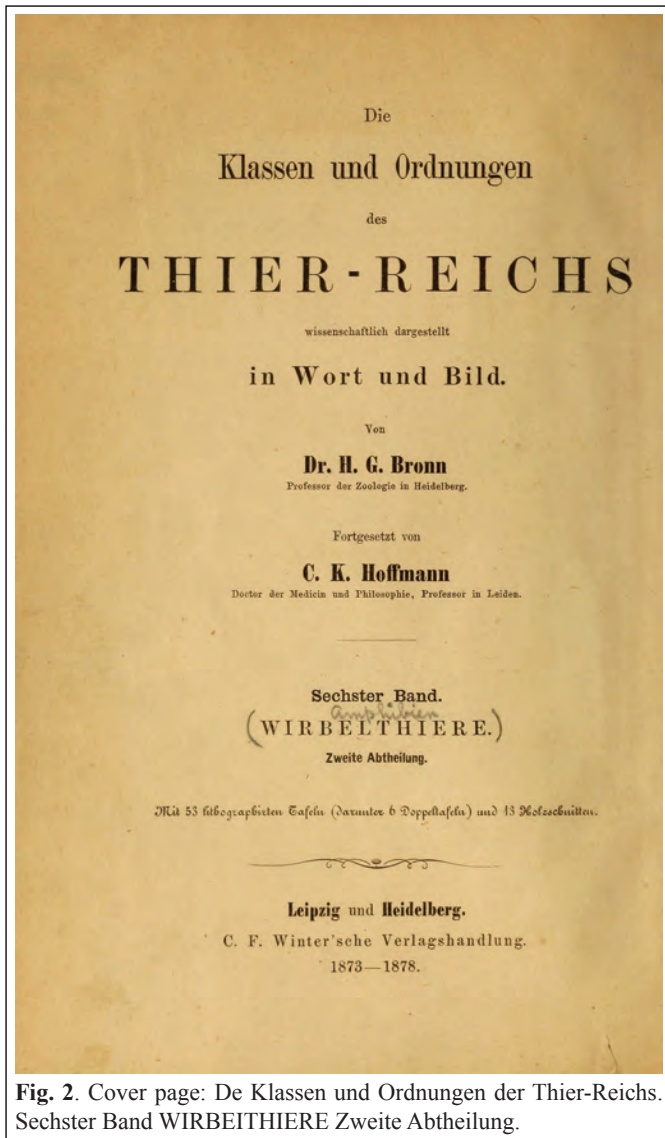


Fig. 2. Cover page: De Klassen und Ordnungen der Thier-Reichs. Sechster Band WIRBEITHIERE Zweite Abtheilung.

TILIEN. III. Schlangen und Entwicklungsgeschichte der Reptilien) (see Figs. 12–14 and the Appendix), published in 1890. These works, in total, consist of 2814 pages, 222 plates with separate legend pages, and 34 text figures. Each of the Teile [Parts] contain coverage of Anatomy, Biology, Systematics, and Biogeography; and some include material on Life-history, and/or Paleontology. The final section in Band 6, Abtheilung 3 (III), is devoted to the embryonic development of reptiles (see Figs. 15–16). The plates in this part are primarily of anatomy, histology, and developmental stages.

Of particular interest in the present context, are Hoffmann's treatments of the systematics of amphibians and reptiles. The four parts (Amphibien, Schildkröten, Eidechsen und Wasserechsen, and Schlangen und Entwicklungsgeschichte), devoted to this aspect, have somewhat different organizations. In the Amphibien Teil, the Klassifikation und geographische Verbreitung section begins with a review of previous systematic works on amphibians (pp. 580–591), and a characterization of biogeographic regions and sub-regions

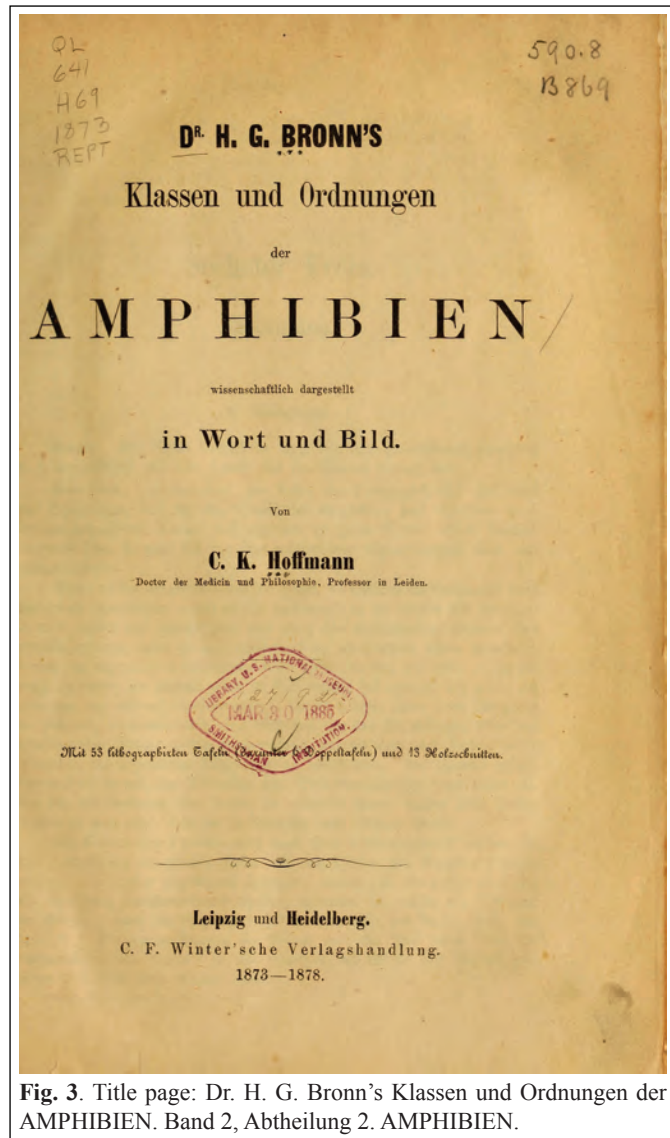


Fig. 3. Title page: Dr. H. G. Bronn's Klassen und Ordnungen der AMPHIBIEN. Band 2, Abtheilung 2. AMPHIBIEN.

(pp. 591–597). The next part, (pp. 597–615), contains the classification and characterization of amphibians in the form of keys adopted by Hoffmann, from the work of Cope (1864, 1865, 1866, 1869), Günther ("1858", 1859), and Strauch (1870). A final part (pp. 615–693) comprises a detailed description of each of the families recognized by Hoffmann, including a diagnostic description of each genus and a summary of the geographic distribution of each genus. Hoffman recognizes 18 families, 169 genera, and 917 species of amphibians. Of these, there are 12 families, 138 genera, and 802 species of frogs and toads; 5 families, 25 genera, and 93 species of salamanders; and 1 family, 6 genera, and 22 species of caecilians.

In the Schildkröten Teil, the Klassifikation und geographische Verbreitung section begins with an outline of biogeographic regions and sub-regions (pp. 341–345), followed by a review of previous systematic works on turtles (pp. 345–372). Next is the classification based on Strauch (1862) adopted by Hoffmann (pp. 372–401). This section consists of

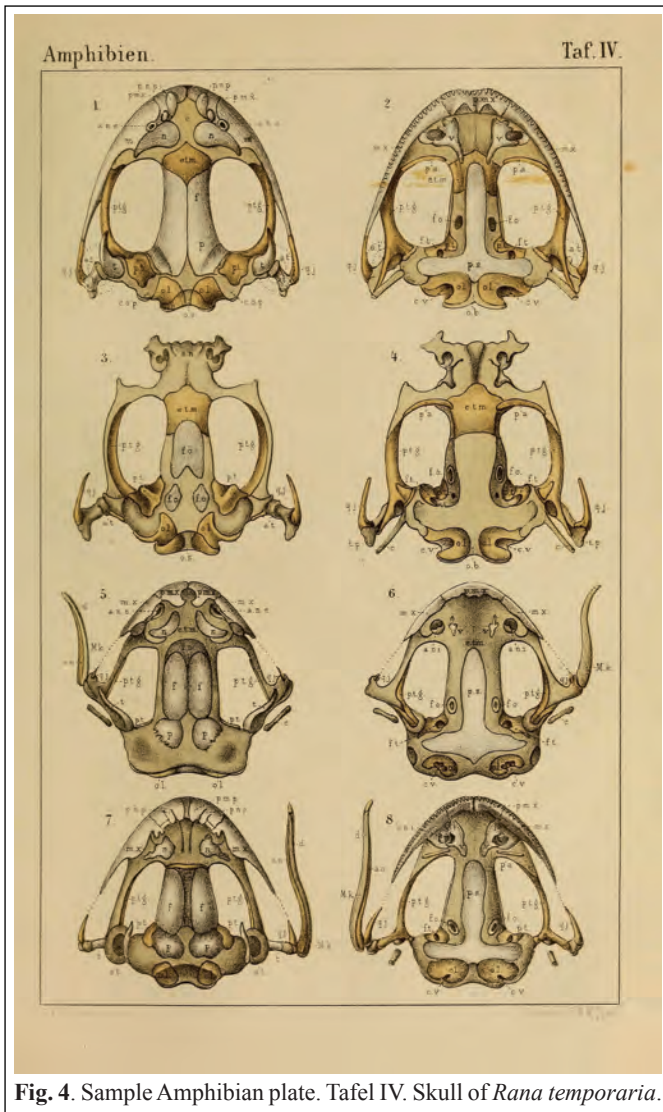


Fig. 4. Sample Amphibian plate. Tafel IV. Skull of *Rana temporaria*.

a detailed description of each family including a diagnostic description of each genus and a summary of the geographic distribution of each genus. Hoffmann recognizes 5 families, 33 genera, and 255 species of turtles.

The Eidechsen und Wasserechsen Teil, Klassifikation und geographische Verbreitung section begins with an introductory section (pp. 1038–1041), followed by a review of previous systematic treatments on crocodilians and lizards (1041–1058). Next is a section on I. Crocodilina (pp. 1058–1064) which begins with the classification adopted from Strauch (1869) by Hoffmann and includes a diagnostic description for each genus and a review of the geographic distribution of each species assigned to the single family. This account recognizes 1 family, 3 genera, and 28 species of crocodilians.

A second part consists of Hoffmann's systematic treatment of II. Sauria which is divided into two sections: I. Leptoglossae (pp. 1064–1182), and II. Pachyglossae (pp. 1182–1298). These are each treated in similar fashion. First is the classification adopted by Hoffmann, including a key to all families and genera assigned to each family. A final part

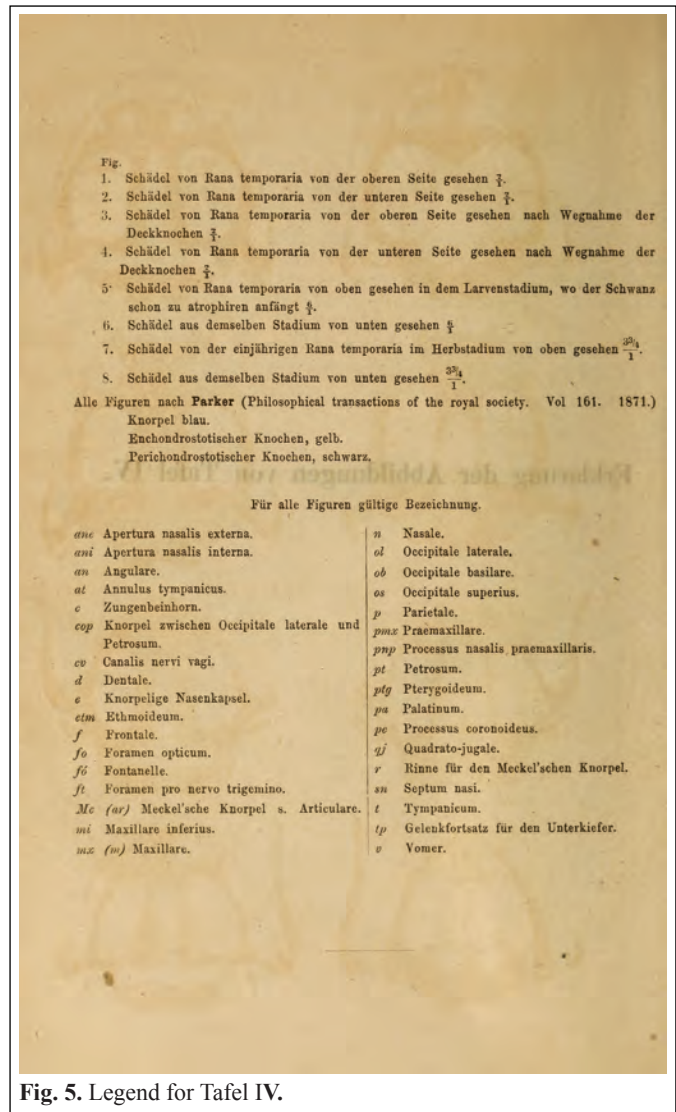


Fig. 5. Legend for Tafel IV.

consists of a detailed description of each family including a diagnostic description of each genus and a summary of its geographic distribution. Hoffmann recognizes 32 families, 435 genera, and 1926 species of lizards.

The Schlangen Teil opens with an introductory section (pp. 1595–1599). It is followed by a review of previous systematic works on snakes (pp. 1599–1618). Next is Hoffmann's classification of snakes including a key to all families and genera (pp. 1618–1812). A final part consists of detailed descriptions of each family, including a diagnostic description of each genus and its geographic distribution. Hoffmann recognizes 28 families, 402 genera and 1760 species of snakes.

One may wonder why this monumental treatment of the morphology, systematics and biology of amphibians and reptiles is so rarely cited today. Adler (2007) regards it, for its time, as the equivalent of Carl Gans' 22 volume *Biology of the Reptilia* (1969–2010). Perhaps Hoffmann's contributions were overshadowed by the appearance of G. A. Boulenger's Catalogues of the amphibians and reptiles in the British Museum of Natural History (1882–1896). These works are fo-

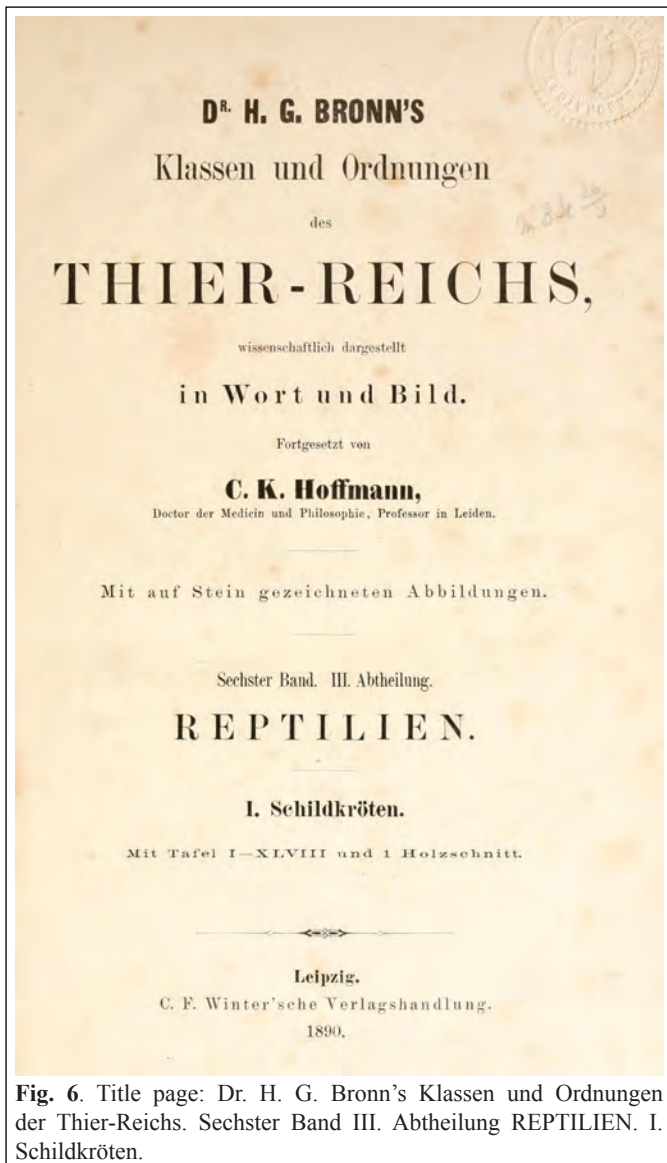


Fig. 6. Title page: Dr. H. G. Bronn's *Klassen und Ordnungen der Thier-Reichs*. Sechster Band III. Abtheilung REPTILIEN. I. Schildkröten.

cused on full descriptions of taxa, including detailed descriptions of each family, genus, and species, and a summary of their geographic distribution. However, Boulenger's works lack the detailed treatment of anatomy, biology and development of Hoffmann's contributions. It may also be that the appearance of Robert Wiedersheim's extremely popular *Lehrbuch der Vergleichenden Anatomie der Wirbelthiere* (1883) also led to Hoffman's anatomical and embryological contributions being somewhat ignored.

HOFFMANN'S SYSTEMATICS

Although Hoffmann's systematic accounts are extensive, he proposes few new available names (e.g., frog family-group Cophomantina, frog genus *Fergusonia*). Moreover, many of his generic names are incorrect subsequent spellings and unavailable, as documented by Wallach, Williams, and Boundy (2014) and Frost (2019). One particular aspect

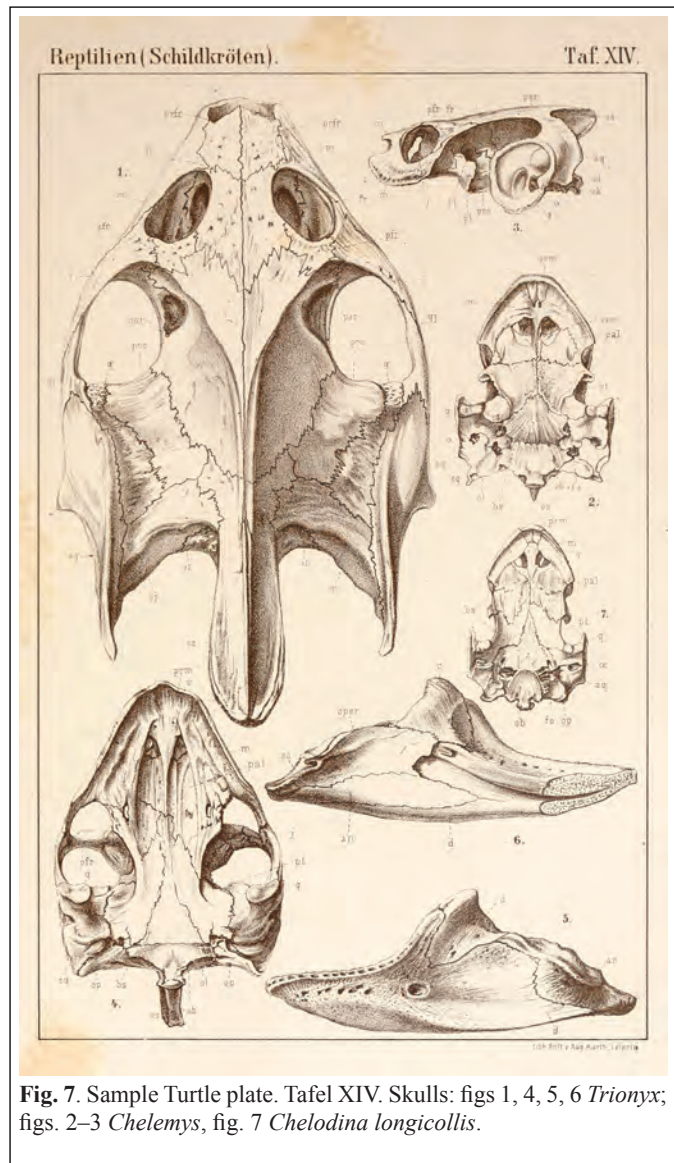


Fig. 7. Sample Turtle plate. Tafel XIV. Skulls: figs 1, 4, 5, 6 *Trionyx*; figs. 2–3 *Chelemys*, fig. 7 *Chelodina longicollis*.

of Hoffmann's systematic treatment is puzzling. Although he notes the number of species referred to every genus that he recognizes, nowhere does he provide a list of species names, diagnoses, or descriptions. I have been unable to ascertain how he generated the species numbers. However, I suspect they are derived from those previously published works that are the basis of his favored classification schemes.

There is also an anomaly in Hoffmann's treatment of some family-group names. In his sections on the classification he adopts, and in other sections, he consistently uses Latin names that conform to the requirements of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature, 1999), hereafter the Code. However, in his historical reviews of the classification schemes in C. Duméril, Bibron, and A. Duméril's masterwork *Erpétologie générale* (1834–1854) and C. Duméril (1863), he is inconsistent. The authors of the *Erpétologie*, as was the mode for French taxonomists of their era, use Latin

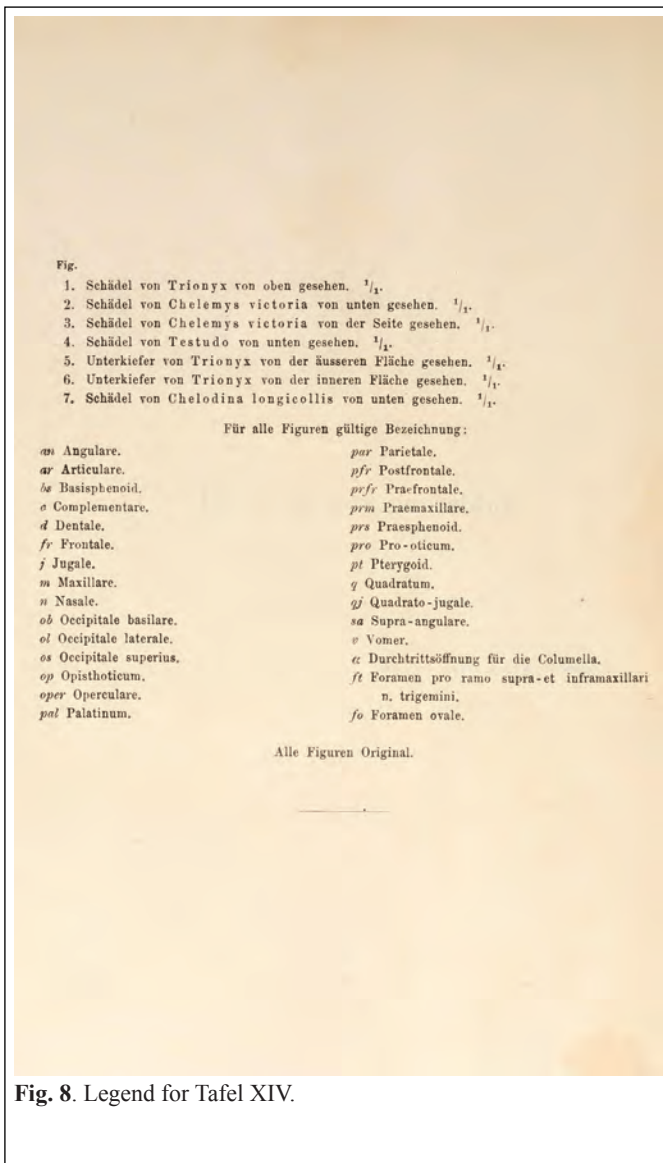


Fig. 8. Legend for Tafel XIV.

names for genus-group and species names. However, these authors often create French vernacular names for taxa in the family-group (Savage, 2020, p. 511). The vernacular names were usually based on Latin generic names of Greek or Latin derivation, that were then gallicized to form the family-group name (e.g., *Dipsas* to family Les Dipsadiens and *Calamaria* to Les Calamariens). The system usually provides alternate family-group names (e.g., Geckotiens ou Ascalabotes and Varaniens ou Platynotes). To create these second names, the authors of the *Erpétologie générale* coined descriptive names of Greek or Latin origin.

Art. 11.7.1.1 of the Code specifies that a family-group name must be a noun in the nominative plural formed from the stem of an available generic name and, per Art. 11.7.1.2, it is clearly used to denote a suprageneric taxon. Art. 29 of the Code, regulates the process for establishing new family-group names. This involves the addition of one of a set of required suffixes: -oidea (superfamily), -idae (family), -inae

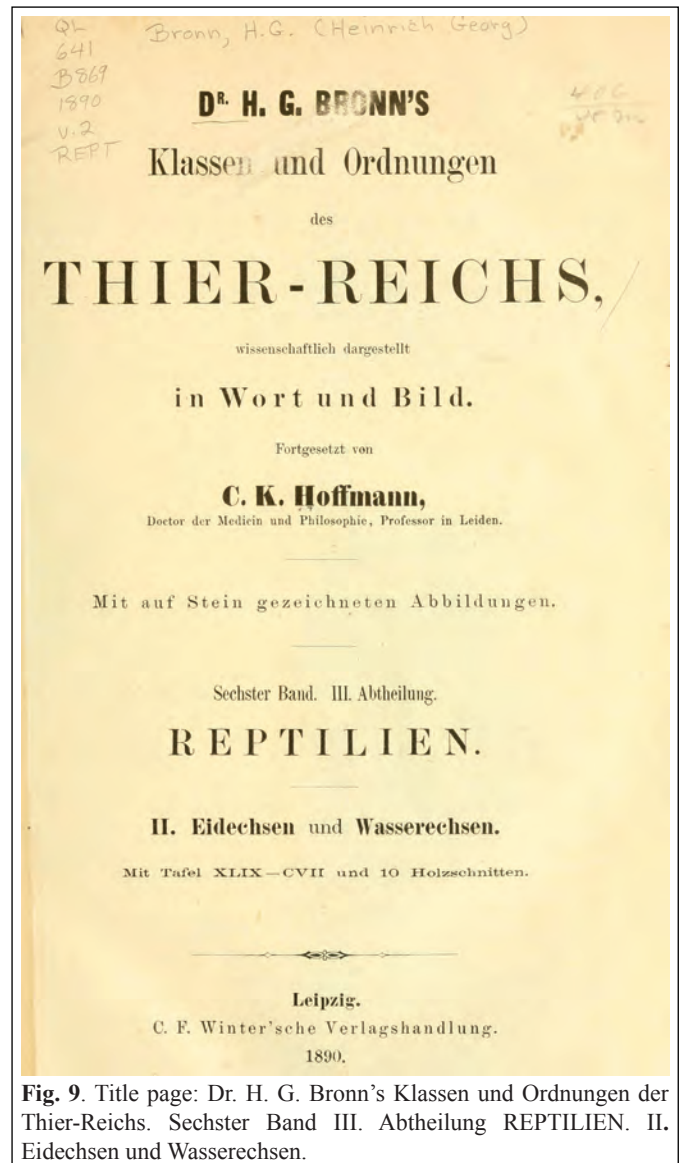


Fig. 9. Title page: Dr. H. G. Bronn's Klassen und Ordnungen der Thier-Reichs. Sechster Band III. Abtheilung REPTILIEN. II. Eidechsen und Wasserechsen.

(subfamily), -ini (tribe), or -ina (subtribe) to the stem of the type genus to form the proposed name (e.g., family Dipsadidae from *Dipsas*). However, under Art. 29.1 of the Code, new family-group names may also be formed by adding the appropriate suffix to the entire name of the type genus (e.g., Dipsasidae).

Art. 7.1.3 requires that "a family-group name, originally proposed with a suffix, other than those specified above is to be corrected." Finally, note that under Art.11.7.2, a vernacular family-group name "published before 1900 but not in latinized form, is available with the original author and date, only if it has been latinized by later authors and has been generally accepted as valid by authors interested in the group and as dating from its first publication in vernacular form".

None of the family-group names in the cited works by C. Duméril, Bibron, and A. Duméril meet any of these criteria and are not available family-group names. It is also important to remember that the author and date of a family-group name,

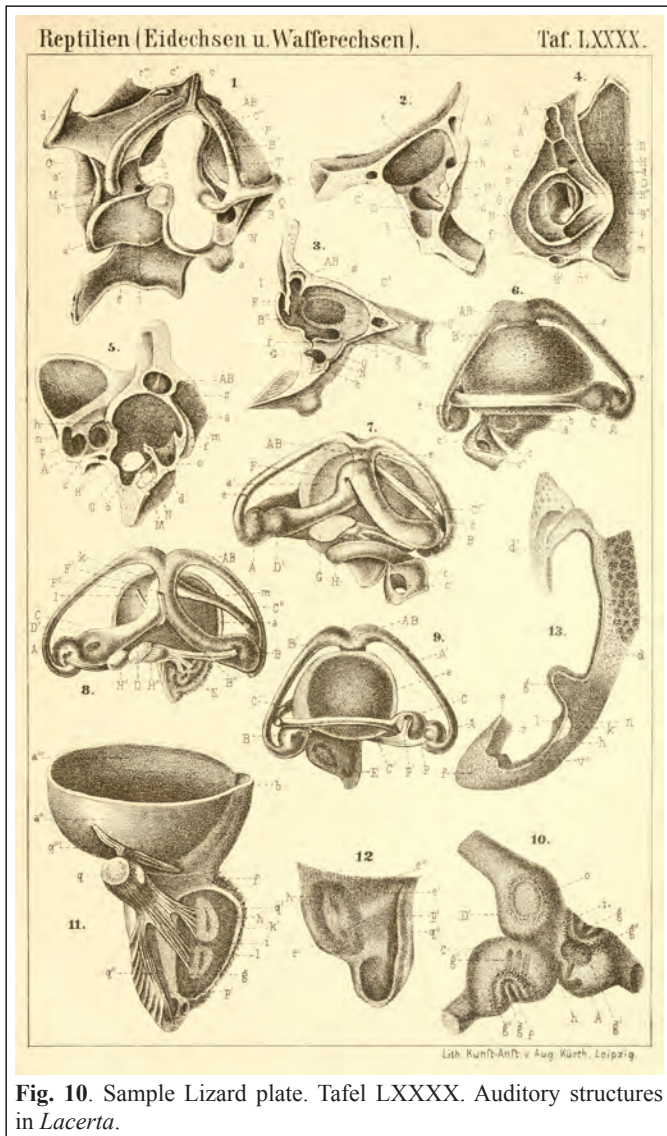


Fig. 10. Sample Lizard plate. Tafel LXXXX. Auditory structures in *Lacerta*.

for purposes of priority, dates from its first use at any family-group level. The name also has the same author and date at every rank of family-group names (Art. 36.1 of the Code).

Hoffmann, in his reviews of the works of the French savants usually uses their coined family-group names. His review in the Amphibien Teil (p. 583) refers to Duméril and Bibron (1841, 1854c). The review of the Schildkröten Teil (pp. 350–352) refers to Duméril and Bibron (1834, 1835). The review in the Eidechsen und Wasserechsen Teil (pp. 1050–1053) is based on Duméril and Bibron (1836, 1837, 1839, 1844, and 1852). The review in the Schlangen Teil (pp. 1604–1607 and 1609) is based on C. Duméril and Bibron (1844a), C. Duméril (1853), and C. Duméril, Bibron and A. Duméril (1854a&b).

There is some variation in the treatment of family names from the *Erp tologie générale*. In the first of the two Amphibien volumes (1841), the section on caecilians lists a single family (Ophiosome ou Céciloïdes). In the section on frogs and toads, no vernaculars are used for family-group names.

Erklärung von Tafel XC.

Die Buchstaben des grossen Alphabets haben für sämtliche Figuren gleiche Bedeutung.
 1. Sagittale Ampulle. A. Sagittaler Bogengang. B. Frontale Ampulle. B'. Frontaler Bogengang. B''. Anfangskanal der frontalen Ampulle. AB. Commissur der Bogengänge. C. Horizontale Ampulle. C'. Lateraler, C'', medialer Theil des horizontalen Bogengangs. D. Utriculus. D'. Recessus utriculi. E. Cochlea. F. Aquaductus vestibuli. F'. Seine Oeffnung in der Schädelhöhle. F''. Dieselbe im Vestibulum oder Sacculus. G. Semicanal s. Canalis lymphaticus. H. Porus oder Nervus acusticus. H'. Ramus vestibularis. H''. Ramus cochlearis n. acustici oder sein Kanal. I. Nervus trigeminus. K. Canalis n. facialis. L. Foramen jugulare. M. Recessus scalae tympani. N. Foramen cochleare s. rotundum. O. Foramen vestibulare s. ovale. P. Obere oder Basalfäche, Q. aussere, R. vordere, S. innere, T. hintere Fläche der Labyrinthpyramide.

- Fig.
 1. Hinterer Theil des Schädels mit rechts herauspräparirtem Labyrinth, von hinten und ein wenig von unten gesehen. $\frac{1}{1}$.
 a. Occipitale basilare. a'. Processus speno-occipitalis. b''. Occipitale laterale. c', c'', c'''. Occipitale superius. d. Squamosum. e. Sphenoidum basilare. o'. Canalis n. hypoglossi.
 2. Vorderer Theil eines in frontaler Richtung durchschnittenen Labyrinthes von hinten gesehen. $\frac{1}{1}$.
 3. Hinterer Theil eines in derselben Richtung durchschnittenen Labyrinthes von vorn gesehen. $\frac{1}{1}$.
 4. Unterer, nach hinten geneigter Theil des querdurchschnittenen Labyrinthes von oben gesehen. $\frac{1}{1}$.
 5. Das Innere des knöchernen Labyrinthes von innen gesehen. $\frac{1}{1}$.

Gültige Bezeichnung für Fig. 2.—5.

a. Vestibulum. b. Cavitas cochleae. c. Vordere, d. hintere Ampullarcavität. e. Scheidewand zwischen a und c. f. zwischen a und d. g. Boden des Vestibulum. h. Oeffnung zwischen a und c. i. zwischen a und d. k. zwischen a und d. l. Einmündung der Commissur der Bogengänge in das Vestibulum. m. Einmündung des horizontalen Bogenganges in das Vestibulum. n. Einmündung des sagittalen, o. des frontalen, p. des horizontalen Bogenganges in seine Ampulle. q. Sulcus rami sacculi n. acustici. r. Grube, aus welcher der Semicanal lymphaticus entspringt. s. Crista vestibularis. t. Sulcus rami cochlearis n. acustici.

Fig. 11a. First page of the legend for Tafel XC.

However, in the salamander volume (1854c), two names are provided for each family (e.g., Atrétoderes ou Salamandridres). See Table 1 for family names used by Hoffmann in reviewing the above cited volumes.

Hoffmann's review of turtles based on the *Erpétologie générale* (1835) provides the following family names: Landschildkröten oder Chersites, Elodites oder Sumpfschildkröten, Potamites oder Flussschildkröten, and Thalassites oder Seeschildkröten. The German names are translations from the French: Tortues Terrestres, Tortues Paludines, Tortues Fluviales, and Tortues Marines, respectively. See Table 2. In his review of the treatment of crocodilians and lizards, as in the *Erpétologie* volumes (1836, 1837, 1841), Hoffmann uses a single name for each family followed in parenthesis by Duméril and Bibron's two names, as in the following examples: Lacertidae (Lacertiens ou Autosaures) and Iguanidae (Iguaniens ou Eupodes). Note that he modifies this arrangement in one case: Ascalobotae (Ascalobotes ou Geckotiens). See Table 2. By contrast, in the volume on snakes, Hoffmann

Fig.

6. Das gesammte, vom perilymphatischen Sacke umschlossene, häutige Gehörorgan von aussen von *Lacerta ocellata*. $\frac{5}{11}$.
 7. Dasselbe Präparat von innen gesehen. $\frac{5}{11}$.
 8. Das ganze häutige Labyrinth von innen. $\frac{6}{11}$.
 9. Dasselbe Präparat von aussen.
 10. Recessus utriculi mit den beiden vorderen Ampullen, von oben und ein wenig von aussen gesehen von *Lacerta agilis*. $\frac{26}{11}$.

Gültige Bezeichnung für Fig. 6.—10.

a. Sacculus. *a'*, Otolith des Sacculus, *a''*, *a'''*, deren Wände. *b.* Die vordere Ausbiegung des perilymphatischen Sackes, aus welcher der Canalis lymphaticus entspringt. *c.* Die sackförmige Erweiterung des Canalis lymphaticus im Recessus scalae tympani. *d.* Pigmentloser Ring am perilymphatischen Sacke, welcher dem Umfange des Foramen vestibulare entspricht. *e.* Die freien Ränder des von den Bogengängen abgelösten perilymphatischen Sackes. *f.* Sulcus transversus der Ampullen. *g.* Crista auditoria. *g'*, Septum cruciatum, *g''*, Plana seminata der Ampullen. *i.* Scheidewand zwischen Recessus utriculi und horizontaler Ampulle. *k.* Ausbiegung des horizontalen Bogenganges nach vorn, in der Nähe seiner Mündung in den Utriculus. *l.* Mündung des horizontalen Bogenganges in den Utriculus. *m.* Mündung der Commissur der Bogengänge in denselben. *n.* Falte zwischen dem horizontalen Bogengang und der Commissur, *n'*, zwischen der letzteren und dem Utriculus, *n''*, zwischen der vorigen und dem Utriculus. *o.* Otolith des Recessus utriculi. *p.* Nervus ampullae sagittalis. *p'*, Nervus ampullae horizontalis. *p''*, Nervus Recessus utriculi. *q.* Nervus ampullae frontalis. *q'*, Ramus basilaris. *q''*, Ramus lagenae. *s.* Oberer Grenzrand des dickeren Epithels an der inneren Wand des Sacculus. *t.* Canal zwischen Utriculus und Sacculus.

11. Die Schnecke mit dem unteren Theil des Sacculus, von innen und ein wenig von hinten gesehen. $\frac{59}{11}$. (*Lacerta agilis*.)
 12. Die isolirte Schnecke von aussen und ein wenig von unten gesehen. $\frac{26}{11}$. (*L. agilis*.)
 13. Querschnitt durch die obere Vereinigung des Knorpelrahmens. $\frac{29}{11}$. (*L. agilis*.)

Gültige Bezeichnung für Fig. 11.—13.

a. Sacculus. *a'*, innere, *a''*, äussere Wand desselben. *b.* Rinne am vorderen Rande des Sacculus. *c.* Öffnung zwischen Sacculus und Schnecke. *d.* Die Knorpellamelle, *d'*, ihr vorderer Rand, *d''*, ihr Wulst. *e.* Membrana Reissneri. *e'*, Falte bei ihrer Umbiegung zum Dach der Schnecke. *e''*, Falte des Daches. *f.* Die Zellmasse am hinteren Rande der Schnecke. *g.* Der vordere Schenkel des Nervenknorpels. *g'*, sein Wulst. *h.* Der hintere Schenkel des Nervenknorpels. *h'*, seine innere scharfe Kante. *i.* Die Brücke des Nervenknorpels. *k.* Membrana Reissneri, *k'*, ihre obere, *k''*, ihre untere Hälfte. *l.* Das Organon Köllikeri. *m.* Scala vestibuli. *n.* Scala tympani. *o.* Äussere, *o'*, innere Wand des Sacculus perilymphaticus. *p.* Lagenae, *p'*, ihr Otolith. *q.* Ramus ampullae frontalis. *q'*, Ramus basilaris. *q''*, Ramus lagenae. *q'''*, Ramus sacculi r. cochlearis n. acustici. *r.* Epithel der Membrana Reissneri. *r'*, des Nervenknorpels, *r''*, des hinteren Knorpelschenkels, *r'''*, der Lagenae. *s.* Membrana Corti.

Alle Figuren nach Clasen (133).

Fig. 11b. Second page of the legend for Tafel XC.



Fig. 12. Title page: Dr. H. G. Bronn's Klassen und Ordnungen der der Thier-Reichs. Sechster Band III. Abtheilung REPTILIEN. III. Abtheilung. REPTILIEN, Schlangen und Entwicklungsgeschichte der Reptilien.

converts some of Duméril, Bibron, and Duméril's names to names derived from Greek or Latin. These names include: twenty-four for Families (Table 3), eight for Unterfamilies and four for Tribes (Table 4). In most cases the family-group names used by Hoffmann in the reviews of the *Erpétologie générale* and Duméril (1853) are unavailable per Art. 29.1 of the Code. Others are names proposed by earlier authors or are synonyms.

The sole exception is Hoffmann's treatment of the genus *Pareas* Wagler, 1830. Duméril, Bibron, and Duméril (1854a) recognize *Pareas* as member of the tribe, sous-famille or grand genre Paréaiens of the family Lycodontiens (p. 340). Hoffman (1890b) converts that designation into the names Unterfamile Pareasina (p. 1606) and Tribus Pareasidae (p. 1609). See Figs. 17–18. However, he does not use either name in the classification of snakes that he proposes (pp. 1618–1811), instead placing *Pareas* in the family Amblycephalidae (p. 1750).

The question thus arises, are Hoffmann's Pareasina (as a subfamily) and/or Pareasidae (as a tribe) available names? Art. 11.7.2 of the Code is quite clear in this regard (see p. 4 above). In order for a vernacular name published before 1900 to be available with its original author(s) and date it must be latinized by later authors and generally accepted as valid and as dating from its publication in vernacular form. While Hoffmann latinized C. Duméril, Bibron, and A. Duméril's Paréaiens, no subsequent authors have met the requirements of the Code to make Pareasidae or Pareasina available family-group names. Consequently, as Hoffman's two names are unavailable, Pareidae Romer, 1956 remains the valid name for the family containing *Pareas* Wagler, 1830.

Table 1. Family Names of Amphibians utilized by Hoffmann in his Review of the works of the Dumérils and Bibron.

Coeciliae (for Céciloïdes)	Pipaeformes (for Pipeformes)
Raniformes	Salamandrides
Hylaeformes (for Hyleformes)	Amphiumides
Bufoformes	Proteides

Table 2. Family Names of Turtles, Crocodiles, and Lizards utilized by Hoffmann in his Review of the works of the Dumérils and Bibron.

Dumérils and Bibron's Names	Latin Names	Dumérils and Bibron's French Vernacular	German Vernacular
Turtles			
Chersites		Tortues Terrestres	Landschildkröten
Elodites		Tortues Paludines	Sumpfschildkröten
Potamites		Tortues Fluviatiles	Flussschildkröten
Thalassites		Tortues Marines	Seeschildkröten
Crocodiles and Lizards			
Aspidotes	Crocodyli	Crocodyliens	
Chélopodes	Chamaeleonidae	Caméléoniens	
Ascalabotes	Ascalabotae	Geckotiens	
Playnotes	Varanidae	Varaniens	
Eunotes	Iguanidae	Iguaniens	
Autosaures	Lacertidae	Lacertiens	
Cyclosaures	Chalcidae	Chalcidiens	
Lépidozaures	Scincoidae	Scinciens	

Table 3. Family Names of Snakes utilized by Hoffmann in his Review of the works of the Dumérils and Bibron.

Famille	Famille
Typlophidae	Synantheria
Catodontidae	Diacranter
Holodontes	Oxycephalidae
Aproterodontes	Stenocephalidae
Acrochordina	Anisodontes
Calamarina	Platyrrhinae
Uperodissina	Scytalidae
Plagiodontina	Dipsadidae
Coryphodontina	Conocerci
Isodonta	Platycerci
Lycodontina	Viperidae
Leptognatha	Crotalidae

Table 4. Unterfamilie and Tribus names of Snakes utilized by Hoffmann in his review of the works of the Dumérils and Bibron.

Unterfamilie	Tribus
Boaedonina	Boaedonidae
Lycodontina	Lycodontidae
Eugnathina	Eugnathidae
Pareasina	Pareasidae
Pythonidae	
Tortricidae	
Erycidae	
Boaeidae	

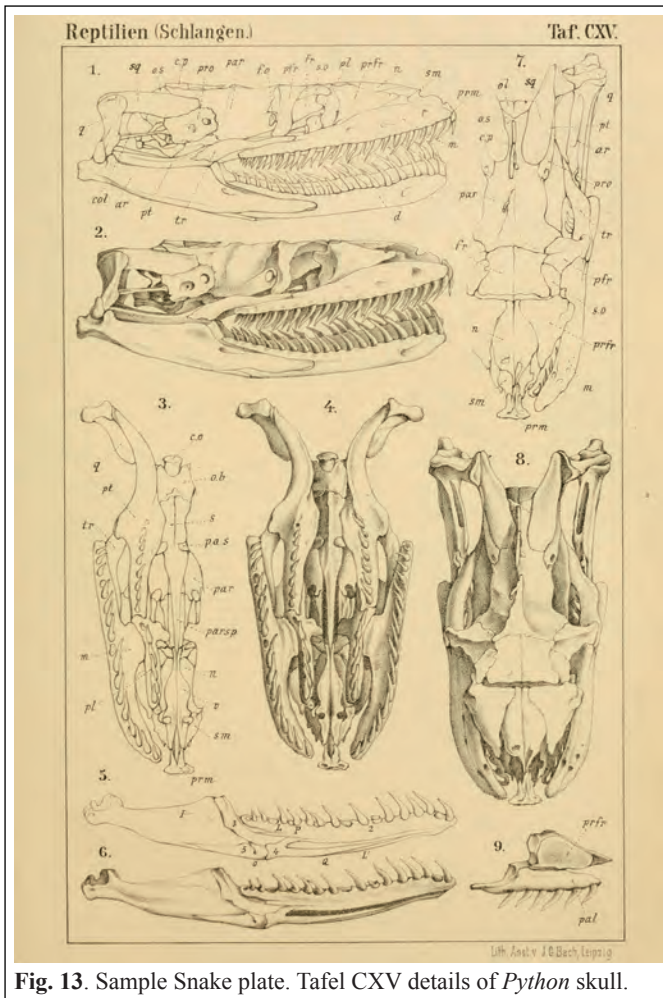


Fig. 13. Sample Snake plate. Tafel CXV details of *Python* skull.

CONCLUSION

Hoffman's great work provides an unparalleled review of the morphology, (especially anatomy and osteology), development and zoogeography of the world's amphibians and reptiles. It also presents a comprehensive systematic treatment of these major vertebrate orders. A *tour de force* by any standard, it was an extraordinary contribution in its day with continuing relevance in the 20th century.

ACKNOWLEDGMENTS

Early in the process of developing this paper, I asked Van Wallach (Cambridge, Mass.) and Jeff Boundy (Louisiana Department of Wildlife and Fisheries) to join me in clarifying the status of Hoffman's nominal family-group names based on *Pareas* Wagler, 1830. They declined but encouraged me to go forward leading to my research on Hoffman's contributions in the preparation of this paper. Kraig Adler's (2007) biography of Hoffmann provided much of the information on Hoffmann's career included herein. Aaron Bauer (Villanova University) and Van Wallach (Cambridge, Massachusetts) reviewed the manuscript and provided many helpful comments

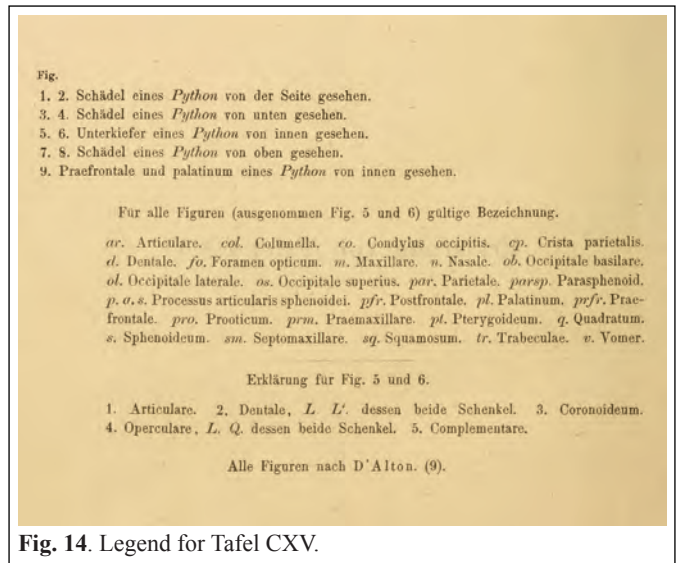


Fig. 14. Legend for Tafel CXV.

for its improvement. Rebecca Papendick provided help with computer and word processing issues. All are thanked for their contribution to the final product.

REFERENCES¹

- Adler, K. 2007. Hoffmann, C. K. (1844–1903). p. 162. In K. Adler (Editor), *Contributions to the History of Herpetology. Volume 2. Society for the Study of Amphibians and Reptiles*. St. Louis, Missouri. 273 p.
- Boulenger, G. A. 1882a. *Catalogue of the Batrachia Gradientia s. Caudata and Batrachia Apoda in the collection of the British Museum, 2nd ed.* British Museum (Natural History), Taylor and Francis, London. vii, 127 p., 9 plates.
- Boulenger, G. A. 1882b. *Catalogue of the Batrachia Salientia s. Ecaudata in the collection of the British Museum, 2nd ed.* British Museum (Natural History), Taylor and Francis, London. xxi, 495 p., 30 plates.
- Boulenger, G. A. 1885a. *Catalogue of the Lizards in the British Museum (Natural History), Vol 1, 2nd ed.* British Museum (Natural History), Taylor and Francis, London. xii, 436 p., 32 plates.
- Boulenger, G. A. 1885b. *Catalogue of the Lizards in the British Museum (Natural History), Vol 2, 2nd ed.* British Museum (Natural History), Taylor and Francis, London. xiii, 497 p., 24 plates.
- Boulenger, G. A. 1887. *Catalogue of the Lizards in the British Museum (Natural History), Vol 3, 2nd ed.* British Museum (Natural History), Taylor and Francis, London. vii, 575 p., 40 plates.

¹ The convention "1810," 1811 or 1805, "1806" uses quotation marks to indicate the date on the work, when it was actually published in a different year. This is often a problem when the volume of a periodical indicates the year in which various papers were presented at meetings but brought together and published in the following year. It also occurs when the last number of a particular volume was published early in the following year. In some cases the reverse is the case. The publisher, anxious to have the work appear as current as possible, placed a later date on the work's title page when it was actually published in the previous year.

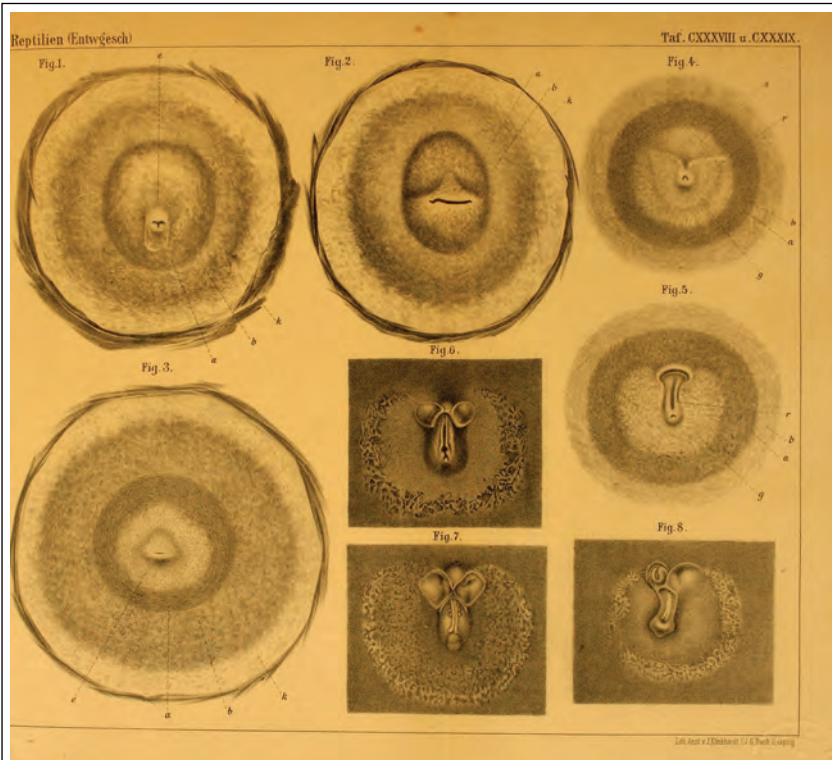


Fig. 15. Sample Developmental plate. Tafel CXXXVIII u. CXXXIX (foldout). Early development in *Lacterta agilis*.

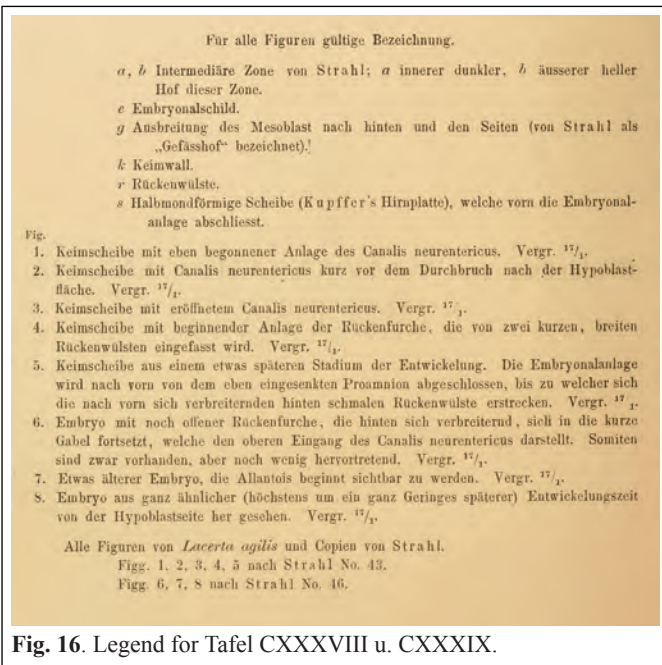


Fig. 16. Legend for Tafel CXXXVIII u. CXXXIX.

- Boulenger, G. A. 1889. *Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum (Natural History)*. New ed. British Museum (Natural History), Taylor and Francis, London. x, 311 p., 6 plates.
- Boulenger, G. A. 1893. *Catalogue of the Snakes in the British Museum (Natural History)*, Vol. I. British Museum (Natural History), Taylor and Francis, London. iv, 448 p., 28 plates.

- Boulenger, G. A. 1894. *Catalogue of the Snakes in the British Museum (Natural History)*, Vol. 2. British Museum (Natural History), Taylor and Francis, London. xi, 382 p., 20 plates.
- Boulenger, G. A. 1896. *Catalogue of the Snakes in the British Museum (Natural History)*, Vol. 3. British Museum (Natural History), Taylor and Francis, London. xix, 727 p., 25 plates.
- Cope, E. D. 1864. On the limits and relations of the Raniformes. *Proceedings of the Academy of Natural Sciences of Philadelphia* n. s. 16(4):181–183.
- Cope, E. D. 1865. Sketch of the primary groups of *Batrachia salientia*. *Natural History Review (London)* n. s. 5:97–120.
- Cope, E. D. 1866. On the structure and distribution of the genera of the Arciferous Anura. *Journal of the Academy of Natural Sciences of Philadelphia* ser. 2. 6(1):67–112, 1 plate.
- Cope, E. D. 1869. A review of the species of the Plethodontidae and Desmognathidae. *Proceedings of the Academy of Natural Sciences of Philadelphia* 21(2):93–118.
- Dowling, H. G. & W. E. Duellman. “1974–1978,” 1978. *Systematic Herpetology: A Synopsis of Families and Higher Categories*. Herpetological Information Service, New York. 128 p.
- Duméril, A. M. C. 1853. *Prodrome de la Classification des Reptiles Ophidiens. Mémoires de l'Académie des Sciences de l'Institut de France* 28:399–536, 2 plates.
- Duméril, A. M. C. & G. Bibron. 1834. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol. I*. Roret, Paris. xiv, 447 p., plates 1–12.
- Duméril, A. M. C. & G. Bibron. 1835. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol. II*. Roret, Paris. ii, 680 p., 2 folding tables, plates 13–24.
- Duméril, A. M. C. & G. Bibron. 1836. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol. III*. Roret, Paris. iv, 517 p., 2 folding tables, plates 25–28, 33, 35, and 43–48.
- Duméril, A. M. C. & G. Bibron. 1837. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol. IV*. Roret, Paris. ii, 571 p., 1 folding table, plates 29–32, 34, 36, 38, 40–42, 50, and 55.
- Duméril, A. M. C. & G. Bibron. 1839. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol. V*. Roret, Paris. viii, 854 p., 4 folding tables, plates 37, 39, 39bis, 41bis, 49, 51–54, and 56–58.
- Duméril, A. M. C. & G. Bibron. 1841 [first sheets published 1838]. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol. VIII*. Roret, Paris. ii, 792 p., 5 folding tables, plates 85–96.
- Duméril, A. M. C. & G. Bibron. 1844. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol. VI*. Roret, Paris. xii, 609 p., 2 folding tables, plates 60–62, 64–69, 71, and 73–73.
- Duméril, A. M. C. & G. Bibron. 1851. *Catalogue méthodique de la collection des reptiles du Museum d'Histoire naturelle de Paris*. Gide et Baudry, Paris. iv, 224 p.
- Duméril, A. M. C., G. Bibron & A. H. A. Duméril. 1854a. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol VII, Part I*. Roret, Paris. vii, 780 p., 1 folding table, plates 59, 63, 70, 72, and 75–82.

Zähne wie bei *Holodontes*, aber keine Zähne im Praemaxillare

4. Fam. *Aproterodontes*.

(Gattungen: *Eryx* mit 4 Arten, *Cylindrophis* mit 3 Arten, *Enygrus* mit 2 Arten, *Leptoboa* mit 1 Art, *Tropidophis* mit 2 Arten, *Platygyaster* mit 1 Art, *Boa* mit 4 Arten, *Pelophilus* mit 1 Art, *Enantecus* mit 1 Art, *Xiphosoma* mit 3 Arten, *Epicrates* mit 2 Arten, *Chilabothrus* mit 1 Art.)

Körper bekleidet mit granulierten Höckerehen, selbst auf dem Vertex, der keine paarigen oder unpaarigen symmetrischen Platten hat

5. Fam. *Aerochordina*.

(Gattungen: *Aerochordus* mit 1 Art, *Chersydrus* mit 1 Art, *Xenodermus* mit 1 Art.)

Körper sehr schlank, rund, vom Kopf bis zum Schwanz fast überall gleich dick 6. Fam. *Calamaria*.

(Gattungen: *Oligodon* mit 4 Arten, *Calamaria* mit 12 Arten, *Rhabdosoma* mit 6 Arten, *Homalozoma* mit 1 Art, *Rhabdion* mit 2 Arten, *Elaeophis* mit 2 Arten, *Aspidura* mit 1 Art, *Carpophis* mit 2 Arten, *Conocephalus* mit 1 Art.)

Körper schuppig, Unterkiefer sehr kräftig, Zähne gleichförmig von Grösse, keine Zähne am Gaumen 7. Fam. *Uperolissina*.

(Gattungen: *Rhinophis* mit 3 Arten, *Uropeltis* mit 1 Art, *Coloburus* mit 1 Art, *Plectrurus* mit 1 Art.)

Die Zähne der Oberkiefer, wie die der Gaumen- und Flügelbeine sind mit ihren Spitzen nach innen, die des Gaumen nach einander gekehrt

8. Fam. *Plagiodontina*.

(Gattung: *Plagiodon* mit 2 Arten.)

Die Zähne sind ungleich von Grösse und nehmen von vorn nach hinten in Grösse zu 9. Fam. *Coryphodontina*.

(Gattung: *Coryphodon* mit 6 Arten.)

Alle Zähne gleich gross und gleich weit von einander entfernt

10. Fam. *Isodontia*.

(Gattungen: *Dendrophis* mit 5 Arten, *Herpetodryas* mit 8 Arten, *Gonyosoma* mit 1 Art, *Spilotes* mit 4 Arten, *Rhinoclis* mit 1 Art, *Ptilonophis* mit 3 Arten, *Elaeophis* mit 14 Arten, *Conopsis* mit 4 Arten, *Abalos* mit 8 Arten, *Entognathus* mit 4 Arten, *Calopisus* mit 4 Arten, *Tretakionus* mit 1 Art.)

Zähne ungleich, die vorderen sind grösser als die hinteren; Körper cylindrisch; Kopf hinten breiter als der Hals . 11. Fam. *Lycodontina*.

(1. Unterfamilie: *Bonedonina*, Gattung: *Bonedon* mit 4 Arten; 2. Unterfamilie: *Lycodontina*, Gattungen: *Lygodon* mit 6 Arten, *Cyclocorus* mit 1 Art, *Cercaspis* mit 1 Art, *Speocetes* mit 1 Art, *Ophites* mit 1 Art; 3. Unterfamilie: *Eugnathina*, Gattungen: *Eugnathus* mit 5 Arten, *Lycophidion* mit 2 Arten, *Alopecion* mit 1 Art, *Heterolepis* mit 1 Art, *Lamprophis* mit 3 Arten; 4. Unterfamilie: *Parasiasina*, Gattungen: *Parasias* mit 2 Arten, *Aplodactyla* mit 1 Art, *Dinodon* mit 1 Art, *Odontomus* mit 2 Arten.)

Schwanz conisch und spitz; Kopf nicht vom Rumpf abgesetzt, Gaumen-zähne deutlich; Kiefer schwach entwickelt . . 12. Fam. *Leptognathia*.

(Gattungen: *Petalognathus* mit 1 Art, *Dipandanus* mit 1 Art, *Leptognathus* mit 3 Arten, *Cochliophagus* mit 1 Art, *Hydrops* mit 1 Art, *Rhachiodon* mit 3 Arten, *Platypteryx* mit 1 Art, *Stenognathus* mit 1 Art, *Ischnognathus* mit 1 Art, *Brachyorrhus* mit 1 Art, *Streptophorus* mit 4 Arten, *Stenmatognathus* mit 1 Art.)

Fig. 17. Schlangen volume. Page 1606, Citation of Unterfamilie Parasina.

de France. 1853) nach dem Bau der Zähne eine neue Classification der Schlangen.

I. Zähne nur an einem der beiden Kiefer, entweder am Ober- oder am Unterkiefer *Opoterodontes* (*Scolopendridae*).

1. Fam. *Typhlopidae*.

(Gattungen: *Typhlops* mit 1 Art, *Ophthalmodon* mit 4 Arten, *Cathetorhinus* mit 1 Art, *Oxychoerophis* mit 6 Arten, *Typhlops* mit 12 Arten, *Cephalolepis* mit 1 Art.)

2. Fam. *Colodontidae*.

(Gattungen: *Colodon* mit 1 Art, *Stenostoma* mit 5 Arten.)

II. Zähne in beiden Kiefern, alle glatt, solide und nicht gefurcht

Aglyphonotus.

3. Fam. *Holodontes*

(1. Unterfamilie: *Pythionidae*, Gattungen: *Morelia* mit 1 Art, *Python* mit 5 Arten, *Liasis* mit 4 Arten, *Nardus* mit 2 Arten; 2. Unterfamilie *Tortricidae*, Gattungen: *Tortrix* mit 1 Art, *Xenopeltis* mit 2 Arten.)

4. Fam. *Aproterodontes*.

(1. Unterfamilie: *Erycidae*, Gattungen: *Eryx* mit 4 Arten, *Cylindrophis* mit 3 Arten; 2. Unterfamilie: *Bonedidae*, Gattungen: *Enygrus* Wagler mit 2 Arten, *Leptoboa* mit 1 Art, *Tropidophis* mit 2 Arten, *Platygyaster* mit 1 Art, *Boa* mit 4 Arten, *Pelophilus* mit 1 Art, *Enantecus* mit 1 Art, *Xiphosoma* mit 3 Arten, *Epicrates* mit 2 Arten und *Chilabothrus* mit 1 Art.)

5. Fam. *Aerochordidae*.

(Gattungen: *Aerochordus* mit 1 Art, *Chersydrus* mit 1 Art, *Xenodermus* mit 1 Art.)

6. Fam. *Calameridae*.

(Gattungen: *Oligodon* mit 4 Arten, *Calamaria* mit 12 Arten, *Rhabdosoma* mit 6 Arten, *Homalozoma* mit 1 Art, *Rhabdion* mit 2 Arten, *Elaeophis* mit 1 Art, *Aspidura* mit 1 Art, *Carpophis* mit 1 Art, *Conocephalus* mit 1 Art.)

7. Fam. *Uperolissidae*.

(Gattungen: *Rhinophis* mit 3 Arten, *Uropeltis* mit 1 Art, *Coloburus* mit 1 Art, *Plectrurus* mit 1 Art.)

8. Fam. *Plagiodontidae*.

(Gattung: *Plagiodon* mit 2 Arten.)

9. Fam. *Isodontidae*.

(Gattungen: *Dendrophis* mit 4 Arten, *Herpetodryas* mit 6 Arten, *Gonyosoma* mit 1 Art, *Spilotes* mit 2 Arten, *Rhinoclis* mit 4 Arten, *Elaeophis* mit 48 Arten, *Abalos* mit 12 Arten, *Calopisus* mit 3 Arten, *Tretakionus* mit 1 Art.)

10. Fam. *Colubridae*.

(Gattung: *Coluber* mit 5 Arten.)

11. Fam. *Lycodontidae*.

(1. Tribus: *Boedonidae*, Gattung: *Boedon* mit 4 Arten; 2. Tribus: *Lycodontidae*, Gattungen: *Lygodon* mit 6 Arten, *Cyclocorus* mit 1 Art, *Cercaspis* mit 1 Art, *Speocetes* mit 1 Art, *Ophites* mit 1 Art; 3. Tribus: *Eugnathidae*, Gattungen: *Eugnathus* mit 1 Art, *Lycophidion* mit 2 Arten, *Alopecion* mit 1 Art, *Heterolepis* mit 2 Arten, *Lamprophis* mit 3 Arten; 4. Tribus: *Parasiasidae*, Gattungen: *Parasias* mit 2 Arten, *Aplodactyla* mit 1 Art, *Dinodon* mit 1 Art, *Odontomus* mit 2 Arten.)

12. Fam. *Leptognathidae*.

(Gattungen: *Petalognathus* mit 1 Art, *Dipandanus* mit 1 Art, *Leptognathus* mit 3 Arten, *Cochliophagus* mit 1 Art, *Hydrops* mit 1 Art, *Rhachiodon* mit 3 Arten, *Platypteryx* mit 1 Art, *Stenognathus* mit 1 Art, *Ischnognathus* mit 1 Art, *Brachyorrhus* mit 1 Art, *Streptophorus* mit 4 Arten, *Stenmatognathus* mit 1 Art.)

Fig. 18. Schlangen volume. Page 1609 Citation of Tribus Parasiasidae.

- Duméril, A. M. C., G. Bibron & A. H. A. Duméril. 1854b. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol. VII, Part 2*. Roret, Paris, xii, pp. 781–1536, 2 folding tables, plates 83–84, 75bis–84bis.
- Duméril, A. M. C., G. Bibron & A. H. A. Duméril. 1854c. *Erpétologie générale ou histoire naturelle complète des reptiles. Vol. IX*. Roret, Paris, xx, 440 p., 1 folding table, plates 97–108.
- Duméril, A. M. C., G. Bibron & A. H. A. Duméril. 1854d. *Erpétologie générale ou histoire naturelle complète des reptiles. Atlas*. Roret, Paris, 24 p, 120 plates (re-issue).
- Frost, D. R. 2019. *Amphibian Species of the World: an Online Reference*. Version 6.1. (Date of access August, 26, 2020). American Museum of Natural History, New York, USA.
- Günther, A. C. L. G. "1858", 1859. *Catalogue of the Batrachia Salientia in the Collection of the British Museum*. Taylor and Francis, London, xvi, 160 p., 12 plates.
- Günther, A. C. L. G. 1864. *The Reptiles of British India*. The Ray Society by Robert Hardwicke. London, xxvi, 452 p., 26 plates.
- Hoffmann, C. K. 1873–1878. Amphibien. In H. G. Bronn (ed.), *Klassen und Ordnungen des Thier-Reichs, wissenschaftlich dargestellt in Wort und Bild*. Vol 6, Abt. 2. C. F. Winter, Leipzig und

- Heidelberg, Germany. 726 p., 52 plates. and accompanying legends on separate pages.
- Hoffmann, C. K. 1879–1890, "1890". Reptilien. I. Schildkröten. In H. G. Bronn (ed.), *Klassen und Ordnungen des Thier-Reichs, wissenschaftlich dargestellt in Wort und Bild*. Vol 6, Abt. 3(1). C. F. Winter, Leipzig, Germany. 442 p., 48 plates. and accompanying legends on separate pages.
- Hoffmann, C. K. 1890a. Reptilien. II. Eidechsen und Wasserechsen. In H. G. Bronn (ed.), *Klassen und Ordnungen des Thier-Reichs, wissenschaftlich dargestellt in Wort und Bild*. Vol 6, Abt. 3(2). C. F. Winter, Leipzig, Germany. pp. 443–1399, plates. 49–207, and accompanying legends on separate pages.
- Hoffmann, C. K. 1890b. Reptilien. III. Schlangen und Entwicklungsgeschichte der Reptilien. In H. G. Bronn (ed.), *Klassen und Ordnungen des Thier-Reichs, wissenschaftlich dargestellt in Wort und Bild*. Vol 6, Abt. 3(3). C. F. Winter, Leipzig, Germany. pp. 1401–2089, plates. 108–170, and accompanying legends on separate pages.
- International Commission on Zoological Nomenclature. 1999. *International Code of Zoological Nomenclature, 4th ed.* International Trust for Zoological Nomenclature. London, UK. 306 p.

- Romer, A.S. 1956. *Osteology of the Reptiles*. University of Chicago Press. Chicago, Illinois. xxi, 772 p.
- Savage, J.M. 2015. What are the correct family names for the taxa that include the snake genera *Xenodermus*, *Pareas*, and *Calamaria*? *Herpetological Review* 46(4):664–665.
- Savage, J.M. 2020. Nicolaus Michael Oppel and his Classification of Amphibians and Reptiles, with Remarks on other 18th and early 19th Century Classification Schemes. *Herpetological Review* 51(3):510–516.
- Strauch, A. 1862. Chelonogische Studien, mit besonderer Bezeichnung auf die Schildkrötensammlung der Kaiserlichen Akademie der Wissenschaften zu St. Petersburg. *Mémoires de l'Académie Impériale des Sciences de St. –Petersbourg* VII Série 5(7):1–196, 1 plate.
- Strauch, A. 1866. Synopsis der gegenwärtig lebenden Crocodiliden. *Mémoires de l'Académie Impériale des Sciences de St. –Petersbourg*. VII Série 10(13):1–120, 1 plate.
- Strauch, A. 1869. Synopsis der Viperiden, nebst Bemerkungen über die geographische Verbreitung dieser Giftschlangen-Familie. *Mémoires de l'Académie Impériale des Sciences de St. –Petersbourg*. VII Série 14(6):1–14, 2 plates.
- Strauch, A. 1870. Revision der Salamandriden-Gattungen nebst Beschreibung einiger neuen oder weniger bekannten Arten dieser Familie. *Mémoires de l'Académie Impériale des Sciences de St. –Petersbourg*. VII Série 16(4):1–109, [1], 3 plates.
- Wagler, J. G. 1830. *Natürliches System der Amphibien, mit vorangehender Classification der Säugthiere und Vögel. Ein Beitrag zur vergleichenden Zoologie*. J. G. Cotta, München, Stuttgart and Tübingen, Germany. vi, 354 p., 1 plate.
- Wallach, V., K .L. Williams, & J. Boundy. 2014. *Snakes of the World: A catalogue of living and extinct species*. CRC Press, Taylor and Francis Group, Boca Raton, Fl. xxvii, 1209 p.
- Wiedersheim, R. E. W. 1883. *Lehrbuch der vergleichenden Anatomie der Wirbelthiere; auf Grundlage der Entwicklungsgeschichte*. Verlag Gustav Fischer, Jena, Germany. ix, 905 p.
- Zaher, H. 1999. Hemipenial morphology of the South American xenodontine snakes, with a proposal for a monophyletic Xenodontinae and a reappraisal of colubroid hemipenes. *Bulletin of the American Museum Natural History*. 240:1–168.

We suggest the following format for citing this article:

Savage, J. M. 2021. The Herpetological Contributions of Christiaan Karel Hoffmann (1844–1903) in H. G. Bronn's *Klassen und Ordnungen des Thier-Reichs*, with Remarks on his Treatment of the Family-Group Names of Constant Duméril, Gabriel Bibron, and Auguste Duméril. *Bibliotheca Herpetologica* 15(1):1–13.

APPENDIX

Summary of C. K. Hoffmann's Contributions to Herpetology In H. G. Bronn's Klassen Und Ordnungen des Thier-Reichs.

1873–1878

Cover page (see Fig. 2): Sechster Band, WIRBELTHIERE, Zweiter Abtheilung

Title page: AMPHIBIEN (see Fig. 3)

Text:

Sechster Kries.

Amphibien.

I. Einleitung [Introduction]. pp. 1–8.

II. Anatomischer Bau [Anatomical Construction]. pp. 8–531.

[III] Begattung, Laichung, Entwicklung [Life history]. pp. 531–580.

IV] Klassifikation und geographische Verbreitung
[Classification and Distribution]. pp. 580–693.

[V] Zur Biologie. [Biology]. pp. 693–701.

Register [Index]. pp. 702–724.

Druckfehler. [errata]. pp. 725–726.

1879–1890.

Title page (see Fig. 4): Sechster Band. III Abtheilung, REPTILIEN.

I. Schildkröten

Text:

Sechster Kreis.

Reptilien.

I. Chelonii – Schildkröten,

II. Saurii – Eidechsen,

III. Hydrosauria – Wasserechsen,

IV. Ophidii – Schlangen.

I. Chelonii = Schildkröten

A. Anatomischer Theil. [Anatomy]. pp. 1–344.

B. Systematischer Theil. [Systematics]. pp. 344–401.

C. Palaeontologischer Theil [Paleontology]. pp. 401–408.

D. Biologischer Theil. [Biology]. pp. 409–426.

Register. Sachnamen [General Index]. pp. 427–439.

Namenregister. [Index of scientific names]. pp. 440–439.

1890a.

Title page (see figure 5); Sechster Band. III. Abtheilung. REPTILIEN. II Eidechsen und Wasserechsen

Text:

II. und III. Eidechsen und Wasserechsen (Saurii und Hydrosauria).

A. Anatomischer Theil. [Anatomy]. pp. 443–1037.

B. Systematischer Theil. [Systematics] pp. 1038–1298.

[C]. Paläontologischer Theil [Paleontology]. pp. 1299–1329.

IV (sic). Biologischer Theil. [Biology]. pp. 1329–1369.

Register. Sachnamen [General Index]. pp. 1370–1391.

Namenregister. [Index of scientific names]. pp. 1392–1399.

1890b.

Title page (see figure 6): Sechster Band. III. Abtheilung. REPTILIEN. III. Schlangen und Entwicklungsgeschichte der Reptilien.

Text:

IV Schlangen (Ophidii s. Serpentes).

A. Anatomischer Theil. [Anatomy]. pp. 1401–1595.

B. Systematischer Theil. [Systematics]. pp. 1595–1812.

C. Palaeontologischer Theil. [Paleontology]. pp. 1812–1814.

D. Biologischer Theil. [Biology]. pp. 1815–1852.

Register. Sachnamen [General Index]. pp. 1853–1871.

V. Entwicklungsgeschichtlicher Theil. [Development]. pp. 1871–2086.

Register des entwicklungsgeschichtlichen Theiles. [Index]. pp. 2087–2089.



Rotgut and Rattlesnakes—A Brief History of “Snake Bite” Whiskey

Matthew P. Bettelheim

5500 Pennsylvania Blvd, Concord, California 94521 USA, blackfish@nasw.org

*There are several men in the wild and wooly west who are afraid M. Pasteur
will discover a better remedy for snake bite than whiskey.*

—Anonymous (Simonds 1900)

Someone asked the Kentucky Colonel if there was any cure for a snake bite except whiskey.

“Who the h— cares whether there is or not!” said the Colonel.

—Anonymous (Milton 1918)

This Snake Bite label (ca. 1940; Fig. 1) originates from the Roaring Camp museum, a carnival-like exhibition in the Harold’s (aka Harolds) Club—a gambling club in Reno, Nevada (USA). In business between 1935 and 1995, in its day Harolds was Nevada’s biggest first-generation casino and showcased general manager Raymond I. “Pappy” Smith’s antique gun collection. In addition to weapons, the museum also paid tribute to cowboys and the “Old West.” The label is most likely an example of either a promotional hotel or travel luggage label, a give-away that originated in the late 1870s and became a collectible for travelers’ suitcases and scrapbooks, or a novelty travel decal, the next generation of travel label repackaged for the automobile.

In this illustrated novelty label, a languid aura of danger surrounds the rattlesnake. Belied by languorous, hooded eyes, this comical Crotalinae telegraphs its intent to strike through the unfurling of its maraca-like tail and a carefully coiled body, reinforced by the classic cartoonists’ trick of employing dashed “movement lines” or “motion lines” to show action. While this cartoonish *Crotalus* is too fanciful to be a true depiction of any particular species, the green scales alone suggest it might be a Mohave Green Rattlesnake (*Crotalus scutulatus scutulatus*), which—like the referenced Roaring Camp in Reno—ranges into Nevada (United States), and is known for its excitability and potent neurotoxic venom.

In this case, the phrase “Snake Bite” (also Snake Bite Medicine, Snake Medicine, or Snake Poison plus their hyphenated cousins) was a popular metaphor in the late 1800s for moonshine: specifically cheap whiskey that was high proof, potent, and illegal (Palmatier 1995). During the Prohibition Era (1920 to 1933), the sale, manufacture, and transportation of alcohol for consumption were banned in the United States of America. A cottage industry arose involving illegally distilling moonshine at night and smuggling it (“rum-running”) to the cities via “bootleggers” in cars modified for speed and luggage space. After Prohibition ended, this practice lived on

through amateur stock car racing and the eventual formation of NASCAR (National Association for Stock Car Auto Racing) (Klein 2017).

Of course, because too much of either—strong liquor or snake venom—could kill you, describing any moonshine as “medicine” was meant tongue-in-cheek. Other colorful metaphors illustrated in this collectible series of labels include “Panther Piss,” “Essence of Cat Fight,” “Fire Water,” and “Centipede Juice” (Fig. 2).

This practice—administering medicines made from snake venom or “oil”—can be traced back to Chinese immigrants who arrived in California beginning with the Gold Rush (1848–1855) on through the construction of the Transcontinental Railroad in 1869. These immigrants brought with them the oil of the Black-banded Sea Krait (aka the Chinese Water Snake; *Laticauda semifasciata*) in a liniment used as a centuries-old remedy against aches and pains (Nickell *undated*), which has since been shown to be high in n-3 polyunsaturated fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) known to have a variety of health benefits (Nobuya 2011).

Pit viper venom’s (aka “Lachesis”) historical role in homeopathic medicine may have much to do with the origins of these snake-themed terms. Recounting his experimentation with Lachesis “as a curative agent,” in the mid-1800s Dr. C. Pearson observed from Mount Pleasant, Iowa, that:

Here in the West it is still quite customary during the summer for hunting parties to carry with them a bottle or two of snake medicine, and if they do not chance to encounter any snakes, they think it safe nevertheless to sometimes take a little of the medicine (Pearson 1864).

The genuine article was admittedly hard to come by, so much so that Pearson admits he wouldn’t “prescribe the remedy entirely” since he was inclined to believe the commercial

supply was limited enough that—due either to “attenuation” (dilution) or because it was outright “not the genuine article”—it was possible he had never *actually* administered Lachesis to a patient (Pearson 1864).

However, what was once a traditional medicine was soon adulterated in the American West by hucksters like cowboy Clark Stanley, “The Rattlesnake King,” who peddled patent “snake oil” medicines that purportedly contained rattlesnake oil and were misleadingly sold as cure-alls. Of course, they neither contained rattlesnake oil, nor cured all. Stanley’s dubious advertising helped fellow con-artists earn the moniker “snake oil salesman” (Nickell *undated*, Nickell 1998, Nickell 2006).

Examples of these moonshine euphemisms preserved in the written record are infrequent but illustrative, like this reference to “Snake Poison” in the monthly Victorian magazine and literary journal, *The Cornhill Magazine*. Therein, several miners in the town of Urora, California (possibly the mining town of Aurora, Nevada), wander into Old Hank’s saloon to “put up yer dust... [and] hev a drink”:

...Old Hank’s whiskey was allowed by all those people who had ever tried it to beat the record, and to be the worst in California. This was something to be proud of, for never was there such rank poison sold across any chemist’s counter as the ordinary miner’s whiskey. Many an old stager, who had sampled that drink at half the camps on the Slope, and who was supposed to be utterly impervious to its effects, had to confess that Old Hank’s was beyond him, and commencing afresh like any novice, would work at it slowly and cautiously for some little time before venturing on anything like an ordinary dose. It was variously called for as tangle-foot, snake-poison, forty-rod (it had the reputation of killing at that distance), chain-lightning, or other fancy names, but it was never called for as whiskey (Unknown Author 1889).

You would be hard pressed to find a better example illustrating the purported strength of a moonshiner’s white lightning than this unknown author’s purple prose. Exaggeration notwithstanding, a whiskey strong enough to have a killing distance is nothing to trifle with.

The curative properties of whiskey alone were touted so frequently, Captain Albert D. Wood remarked in *Some Comfort for Drinkers*, a 20-page treatise on the benefits of alcohol, that “It may in due time be determined by actual experi-

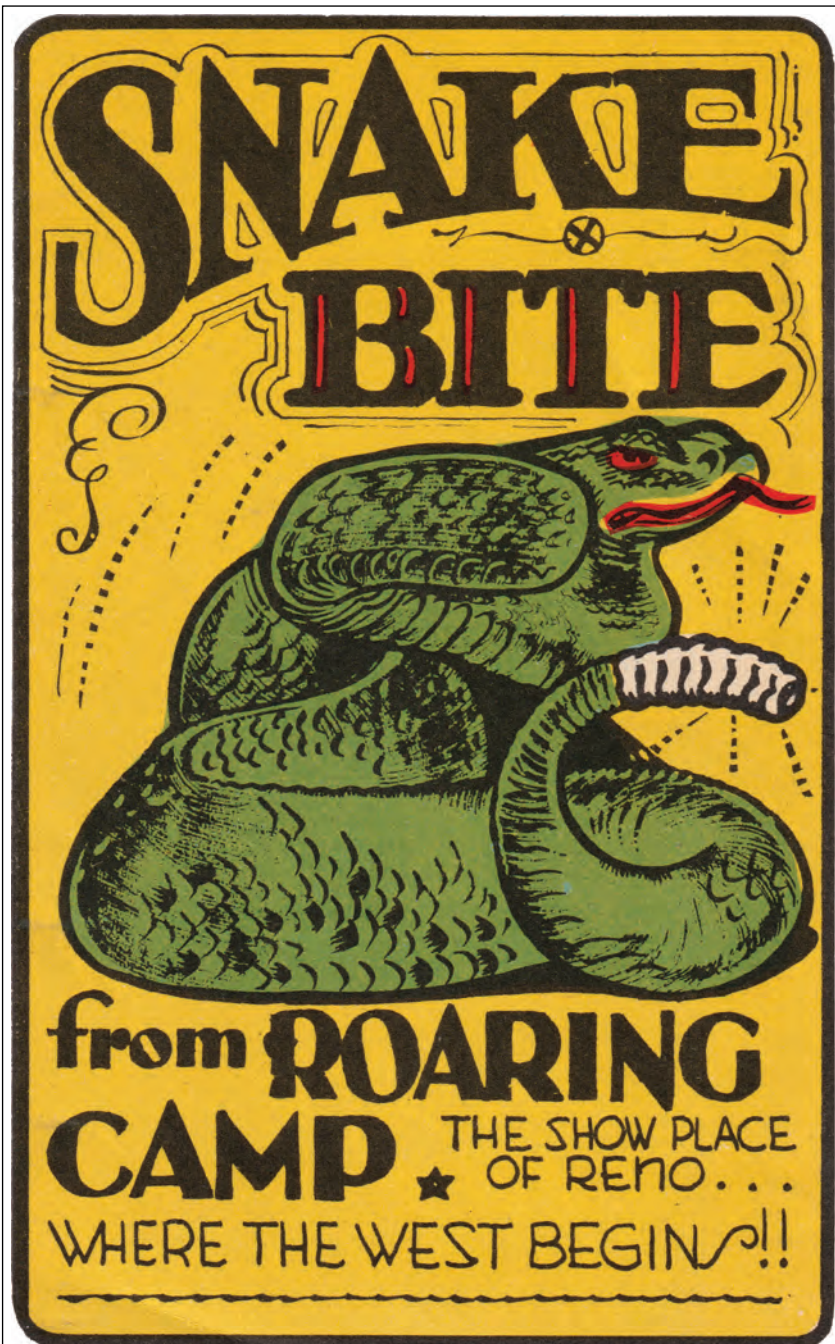


Fig. 1. The label is one example of a series of promotional hotel or travel luggage labels given away as collectibles for travelers’ suitcases and scrapbooks. It originates from the Roaring Camp museum, an exhibit in the Harold’s Club in Reno, Nevada (1935–1995), and appears to feature a fanciful representation of a Mohave Green Rattlesnake (*Crotalus scutulatus scutulatus*). In the late 1800s, the phrase “Snake Bite” was one of many popular metaphors for moonshine or cheap whiskey.

ment that those liable to be snake-bitten should keep on hand a bottle of whiskey, and that those subject to wounds from the serpent of the bottle should ever have a rattlesnake in the closet as a convenient antidote” (Wood 187-?).

One entrepreneur—hired to pilot a boat up the Canadian and Wolf Rivers in the American southwest—thought to make a business of his cargo, which had been provisioned



Fig. 2. Other popular—and exceptionally colorful—metaphors for cheap moonshine whiskey that appeared on companion labels in the novelty Roaring Camp, Reno label series included “Panther Piss,” “Fire Water,” “Centipede Juice,” and “Essence of Cat Fight.”

with everything “from a corkscrew to several gallons of prime old snake medicine that was guaranteed to cure the worst case of snake bite that could be found in the Panhandle of Texas”:

Besides our regular stock in trade, we took along quite a collection of small animals and all kinds of snakes that we could get—some for curiosities and some for real business purposes. We had a pair of gila monsters, a big diamond rattlesnake, sev-

eral prairie rattlers, black snakes, garter snakes, hoop snakes—in fact, we had good and bad snakes—all kinds, sizes and colors, and we certainly did a good business in the snake line. Every town we stopped at the people would come down to the boat to see the snakes. One day, by accident, a little, no-account snake got out of his box and bit a preacher who happened to be on our boat. He got excited and thought he was going to die sure, but the mate got out a bottle of prime old snake medicine and gave him a big dose. In fact, he gave him several doses, and after the mate pronounced him cured he said he would be back next day, and wanted the mate to let a bigger snake get out of the box...

One day there came aboard at Lipscomb a hard looking old sinner who wanted some snake medicine. As it was against the rules and regulations to sell snake medicine to any person unless he had been bitten by a snake, he wanted to know how much we would charge to let one of the snakes bite him. The mate told him that would depend on the size of the snake; a little one, a dollar; a medium-sized one, two dollars; a big one, four dollars; and if he wanted one of the gila monsters to bite him, that would cost him five dollars, with enough medicine thrown in to cure him. After looking him over, he said he guessed he would try that big fellow from Arizona. The mate told him to roll up his sleeve, rub the little one on the back, and the big one would do the rest. After that our business got better right along (Callison 1914).

In an 1869 treatise on hunting and trapping the “wild animate nature of North America,” aptly named author Samuel J. Hunter described an unnamed whiskey remedy suitable for the bite of a Timber Rattlesnake (*Crotalus horridus*), Prairie Rattlesnake (*Crotalus viridis*), Copperhead (*Agkistrodon contortrix*), and Cottonmouth (*Agkistrodon piscivorus*) thusly:

I will now tell you of a medicine that never fails to cure the bite of this snake, if taken in time. When bitten, take good whiskey and drink as fast as you can stand it; allow yourself to feel the liquor before you stop taking it; I mean, drink a half pint at the start, and repeat the dose if the liquor does not affect you; afterwards you may reduce the dose; and when you feel the effect considerably, cease drinking; but if you become sober too soon, repeat the dose, and continue drinking a little (just enough to make you feel the effect) for one day; at the same time bathe the wound with a compound of lard, salt and charcoal – bath till the swelling has nearly abated. If the pa-

tient is not used to strong liquor, you should not give too much at a time, nor will he require it so often as one that is, for too much whisky is sometimes as fatal as the bite (Hunter 1869).

In the travelogue of some later adventurers, appropriately named *The Wagonaunts Abroad: Two Tours in the Wild Mountains of Tennessee and North Carolina, Made by Three Kegs, Four Wagonaunts, and a Canteen*, by A. T. Ramp (Doak 1892), the Wagonaunts provisioned their travels thusly:

Our equipment consisted of Ben, the driver, two strong roadsters, a stout two-seated wagon, fishing rods and lines, a book of trout flies, a box of provisions for a cruise of ten days, consisting of potted meats, boiled ham, beaten biscuits, cheese, coffee, sugar, pepper, salt, a coffee pot, tin cups, knives and forks, and a five-gallon demijohn of old rye [whiskey] as a preventative of snake bites, a corkscrew for drawing obstinate fish, a quart bottle wherein to store provision of snake medicine upon brief fishing jaunts away from the demijohn base of operations.

The Wagonaunts’ account neatly illustrates not only the use of Snake Medicine in the everyman’s alcohol-infused vernacular, but also reinforces the possible origin story of the metaphor—the use of strong alcohol as a painkiller or antidote for snake bites.

In the end, however, the spirit of administering moonshine as medicine was no doubt best personified by comedian and actor W.C. Fields, who remarked, “Always carry a flagon of whiskey in case of snakebite, and furthermore, always carry a small snake.”

However it came to pass, the practice of calling moonshine “Snake Bite” or something equally imaginative in the common vernacular was short-lived, likely dying an ignoble death with the end of the United State’s Prohibition. And so with time, moonshine’s more flamboyant trappings like “Snake Bite” and “Panther Piss” were all but forgotten by the 1940s. One could argue that it has experienced a revival of sorts through contemporary mixology—today American barkeeps serve a high-octane “snakebite” cocktail made with whiskey and lime juice, while those in the United Kingdom serve a “snakebite” made with equal parts cider and lager. There are also off-the-shelf options, like the 90-proof Canadian whiskey Snakebite made with Yukon Jack whiskey and lime juice; the 70-proof Canadian apple cider-flavored whiskey Serpent’s Bite; or the Two Pitchers’ Brewing Co.’s Snake Bite apple cider shandy with a splash of cranberry. But no matter how you shake it, these adulterated alcohols couldn’t hold a candle to the forgotten moonshine of yore, serving instead as a token nostalgic nod to the rotgut and rattlesnakes of America’s forgotten Wild West.

ACKNOWLEDGEMENTS

Special thanks to Mark Miller, one anonymous reviewer, and the editor, Breck Bartholomew, for comments on the manuscript.

REFERENCES

- Callison, John James. 1914. *Bill Jones of Paradise Valley, Oklahoma; His Life and Adventures for Over Forty Years in the Great Southwest – He Was a Pioneer in The Days of the Buffalo, the Wild Indian, the Oklahoma Boomer, the Cowboy and the Outlaw*. M.A. Donohue & Co., Chicago. Frontis, 328 p.
- Doak, Henry Melvil. 1892. *The Wagonaunts Abroad: Two Tours in the Wild Mountains of Tennessee and North Carolina, Made by Three Kegs, Four Wagonaunts, and a Canteen*, by A. T. Ramp. Southwestern Publishing House, Nashville. 300 p.
- Hunter, Samuel J. 1869. *The Hunters’ and Trappers’ Illustrated Historical Guide, Treating Only of the Wild Animate Nature of North America*. George Knapp & Co., St. Louis. 208 p.
- Klein, Christopher. 2018. How Prohibition Gave Birth to NASCAR. History [accessed 26 December 2020].
- Milton, Bert. 1918. *Trench Gas: a Bunch of Many Clever Chestnuts*. The A.M. Davis Co., Boston. 30 p., [2].
- Nickell, Joe. Undated. Nickell Snake Oil Collection. *New York Heritage Digital Collections*.
- Nickell, Joe. 1998. Peddling Snake Oil. *Skeptical Inquirer* 8(4).
- Nickell, Joe. 2006. Snake Oil: A Guide for Connoisseurs. *Skeptical Inquirer* 16(3).
- Nobuya Shirai. 2011. Fish Sources of Various Lipids Including n-3 Polyunsaturated Fatty Acids and Their Dietary Effects. Pp. 61–71 in: Hernandez, Ernesto M. and Masashi Hosokawa (Editors) *Omega-3 Oils: Applications in Functional Foods*, AOCS Press, Urbana, Illinois.
- Unknown Author. 1889. The First and Last Preacher of Urora. *The Cornhill Magazine* XII:49–64.
- Palmatier, Robert. 1995. *Speaking of Animals: A Dictionary of Animal Metaphors*. Greenwood Publishing Group, Westport. xii, 472 p.
- Pearson, C. 1864. Lachesis as a Remedy. *The American Homeopathic Review* 4(5):210–212.
- Simonds, David Kendall. 1900. *American Wit and Humor; A Collection from Various Sources Classified Under Appropriate Subject-Headings*. G.W. Jacobs & Co., Philadelphia. 157 p.
- Wood, Albert D. 187-?. *Some Comfort for Drinkers*. J. Loveday, Ottawa. 21 p.

We suggest the following format for citing this article:

Bettelheim, M. P. 2021. Rotgut and Rattlesnakes— A Brief History of “Snake Bite” Whiskey. *Bibliotheca Herpetologica* 15(2):14–17.



Dr. John Mair, Captain Collet Barker,
and the discovery of the Australian Keelback,
Tropidonophis mairii (Serpentes, Colubridae)

Glenn M. Shea

Sydney School of Veterinary Science B01, University of Sydney, NSW, Australia 2006 and Australian Museum
Research Institute, Australian Museum, 1 William St, Sydney, NSW 2010, glenn.shea@sydney.edu.au

Abstract. The Australian Keelback, *Tropidonophis mairii*, was named for the donor of the type specimen, Dr. John Mair, a military surgeon who came to Australia with the 39th Regiment of the British army, and whose later career was largely spent in the Mediterranean and Canada. Mair's activities in Australia, centred around Sydney (and later Hobart, on a separate posting), did not overlap with the distribution of the species. Instead, it is likely that the holotype (now lost) was collected by another member of the 39th Regiment, Captain Collet Barker, who was known to have collected snakes at Fort Wellington on the Cobourg Peninsula of the Northern Territory (within the range of *T. mairii*), and later at Perth and Albany in Western Australia, and Mair was simply the conduit for the specimen reaching England.

Keywords: John Mair, Collet Barker, *Tropidonophis*, 39th Regiment of Foot, Fort Wellington, Temperance Movement, Chatham.

The Keelback, *Tropidonophis mairii*, is currently considered the only natricine snake in Australia, although there are many species in adjacent New Guinea (Malnate and Underwood 1988, Shea 1990, Kraus and Allison 2004). The species was first described (as *Tropidonotus Mairii*) by John Gray in 1841, as part of a catalogue of the reptiles and amphibians of Australia appended to an account of George Grey's explorations in Australia. However, the description is brief and provides little morphological data relevant to current snake systematics other than that the dorsal and lateral scales were keeled and that the "loreal scales" were "equal", suggesting the species possessed loreal scales (assuming Gray's concept of these scales equated to the modern concept). The holotype is now lost, and as neotype, Malnate and Underwood (1988) designated a type of a subsequent Gray species, *Tropidonotus australis*, described in the following year (Gray 1842) from one or more specimens collected from Port Essington by the English naturalist John Gilbert, collector for the ornithologist John Gould. This specimen, originally 41.10.13.37 in the British Museum, London, now reregistered as 1946.1.13.52 in the Natural History Museum London, was listed as the holotype of *T. australis* by Malnate and Underwood (1988). However, Boulenger (1889) and Cogger et al. (1983) listed four syntypes for the species, adding the three specimens 1946.1.12.88–90 which, while also bearing the locality Port Essington, lack a collector. Given that Gray's description does not give any indication that he examined more than one specimen in describing *T. australis*, if these three specimens are considered part of the type series, then Malnate and Underwood's listing of 1946.1.13.52 as holotype of *T. australis* should be considered a lectotype designation (Code of Zoological Nomenclature Article 74.6).

Despite this forced synonymy, the question still remains, due to Gray's description of two different nominal species in subsequent papers, whether the two species were conspecific in their original concept. The description of *Tropidonophis mairii* offers little assistance in answering this question, and the collection data for the lost holotype likewise offers little. In the description, Gray (1841: 442) simply notes "Inhab. New Holland, Dr. Mair, 39 Reg." Earlier in the paper, Gray (1841: 431) lists the source as "Dr. Mair, 39th Reg. Mus. Chatham." In the same list, Mair is credited as the source of specimens of three other snake species: *Calamaria diadema*, *Naja bungaroides* var. and *Trimesurus olivaceus*, all from "New Holland".

Who was Dr. Mair, and how and where did he come into contact with the snake that now bears his name? Could it have come from nearby New Guinea rather than Australia? Malnate and Underwood (1988) stated that the holotype was in the Chatham Museum, in northern Kent, where it was "no. 39 Reg.". This interpretation of 39 as a registration number is incorrect and seems to be based on the orthography of Gray (1841: 442). Dr. John Mair was Assistant Staff Surgeon of the 39th Regiment of Foot (the Dorsetshire Regiment) (Gray 1841: 431, Ackroyd et al. 2006). The 39th Regiment was assigned to the garrison at Sydney in 1826, the eighth regiment to be posted to the Sydney penal settlement (the previous deployments had been the New South Wales Corps (1789–1809), the 73rd Regiment (1809–1815), 46th Regiment (1814–1817), 48th Regiment (1817–1824), 3rd Regiment (1821–1827), 40th Regiment (1823–1824) and 57th Regiment (1825–1831); Lee 1906).

For biographical information on Mair, I am indebted to Professor Laurence Brockliss, who provided extensive mate-

rial gleaned from War Office archives, the basis for the analysis of Ackroyd *et al.* (2006). Otherwise-unreferenced information in the following account is derived from material sent to me by Professor Brockliss.

John Mair was born in Aberdeen, Scotland on 7 March, 1798, one of two known children (the other was Jean Mair) of George Mair (commander and part owner of vessels trading between America and Britain) and Carolina Stewart, who had married in 1795 at St Nicholas's church in Aberdeen. There is also some indication (Anon 1832a) that Mair was more distantly related to Captain Alexander Mair, Deputy Governor of Fort George (d. 18 January 1836), and his sons, the physician William Crosbie Mair and Major Arthur Mair of the 62nd Regiment (Smith and Paul 1915, Waterston and Shearer 2006), providing a familial link with the military and medical professions.

John Mair was apprenticed for three years to an Aberdeen physician, James Davidson. He received his M.A. degree from Marischal College, Aberdeen in 1815 (his mother was the daughter of John Stewart, professor of mathematics at Marischal College) (note: Ackroyd *et al.* 2006 report that his M.A. was from King's College), and gained his M.D. from the University of Edinburgh in 1819, for the thesis "*De peste, ejusque relationibus morbidis*" (Anon 1824; Fig. 1). He took courses for his medical training at Aberdeen, Edinburgh, London and Paris, received his hospital training between 1814–1821 in London (St Georges Hospital, where he worked under Sir Benjamin Brodie (Morgan 1867), and the Royal Westminster Eye Infirmary), Edinburgh (Royal Infirmary) and Paris (Hôtel Dieu, where he worked under Baron Guillaume Dupuytren and Jacques Lisfranc (Morgan 1867), Val de Grâce, L'Hôtel Dublin Garde Royal), and became a member of the Royal Medical Society of Edinburgh. In 1821, he was examined and interviewed by the Army Medical Board (presumably by Sir William Blizard and John Abernethy, who certified him qualified for the surgeoncy of any regiment; Morgan 1867), and on 8 November 1821, became a Hospital Assistant, based at Chatham. The normal procedure for new appointments to the Army Medical Service was an initial period of training at Chatham before being sent to a regiment (Kaufman 2006). Sometime between 1821 and 1823, Mair was assigned to the army depot infirmary at Newport, Isle of Wight, and between 1823–1826 he was based in the Cape of Good Hope. On 10 November 1825, he was posted to the 39th Regiment of Foot, as Assistant Surgeon, although this order would have taken some time to reach him in South Africa.

At that time, the 39th Regiment was stationed in Cork, in Ireland, to keep the peace during the agrarian unrest there, but it had received orders (10 July 1825) to travel from Cork to Chatham, as a preliminary to deployment to Sydney (Anon 1826a, Cannon 1853, Mulvaney and Green 1994). From Chatham, a number of detachments were sent to Australia as guards on convict transports, the first of which seems to have been under the command of Captain Joseph Wakefield, who

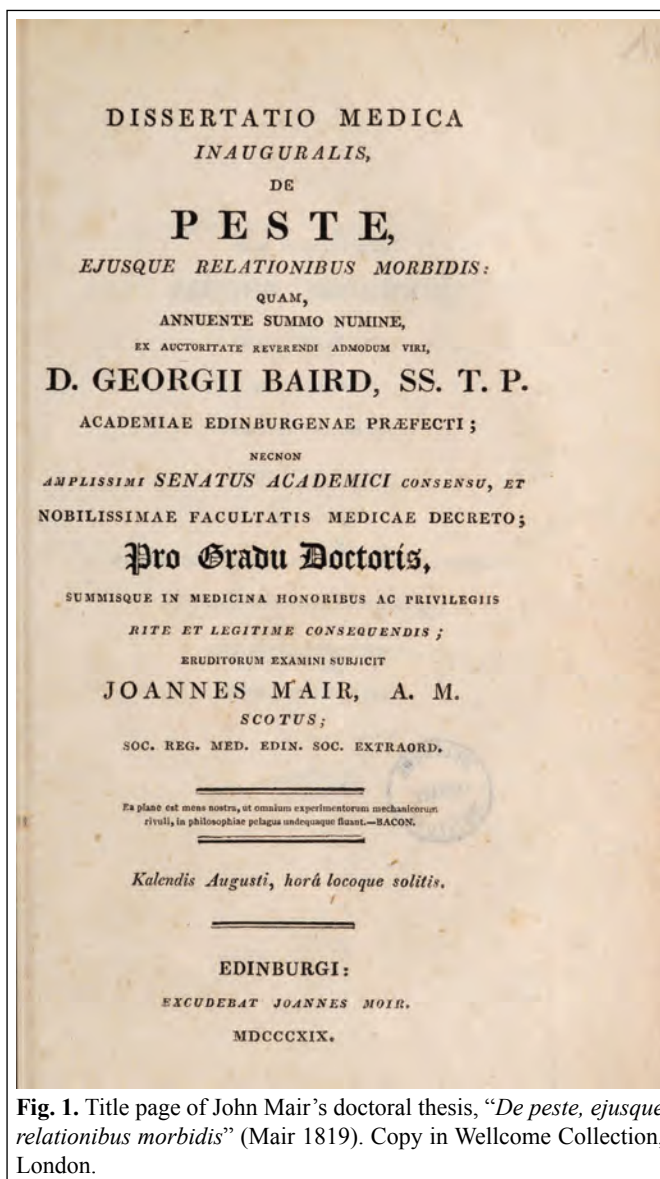


Fig. 1. Title page of John Mair's doctoral thesis, "*De peste, ejusque relationibus morbidis*" (Mair 1819). Copy in Wellcome Collection, London.

arrived in Sydney on 7 June 1826 on board the "Woodman" (Anon 1826b). At least 17 additional detachments arrived, mostly as convict guards, over the next 12 months, and by 5 May 1827, all six service corps, together with two officers and 59 men from the four depot corps, had embarked for Sydney (Cannon 1853, Mulvaney and Green 1994) (Table 1).

At the beginning of 1828, the depot corps of the 39th Regiment remaining in Chatham were broken up, and the officers and men in these were sent to New South Wales between 1 February 1828 and 30 August 1830 (Cannon 1853).

Mair seems to have arrived in Sydney in association with, but independently from, this second contingent. He is recorded as arriving (as "Dr. Muir, 39th Regiment") on 16 November 1828, on board the "Dragon" (Anon 1828d), although the Hobart-Town Courier of 8 November 1828 listed "Dr. Muir" as a passenger on both the "Prince George", intending to sail from Hobart on 11 November for Sydney, and the "Dragon", sailing on 13 November (Anon 1828e).

Table 1. Arrival in Sydney (or Hobart) of detachments of the 39th Regiment. Full names of the officers are based on the Roll of Officers provided by Atkinson (1947); in some cases, the names in the Roll of Officers (in square brackets) vary from that provided by the local press.

Ship	Date of arrival in Sydney	Port of Embarkation	Officers of 39th Regiment	Reference
First Contingent				
Woodman	7 Jun 1826	London	Capt. Joseph Wakefield; Ensign Joseph Long Innes	Anon (1826b)
Regalia	5 Aug 1826	Dublin	Lieut. William Sacheverall Coke	Anon (1826c)
Earl St Vincent (to Hobart)	13 Aug 1826 (Hobart)	England	Capt. Smith [Henry Smyth]	Anon (1826d,e)
Portland (Hobart to Sydney)	11 Sep 1826	Hobart	Capt. Smith [Henry Smyth]	Anon (1826e)
Marquis of Huntley	12 Sep 1826	Sheerness	Maj. Donald McPherson	Anon (1826f)
England	18 Sep 1826	London	Maj. George Pitt D'Arcy	Anon (1826g)
Boyne	28 Oct 1826	London, Cork	Capt. Thomas Wright	Anon (1826h)
Speke	26 Nov 1826	Sheerness	Lieut. Henry Clarence Scarman	Anon (1826i)
Phoenix	25 Dec 1826	Dublin	Lieut. Charles Cox; Ensign Charles Benjamin Lloyd	Anon (1826j)
Albion	12 Feb 1827	Portsmouth	Capt. Crofty [Francis C. Crothy]	Anon (1827a)
Midas	12 Feb 1827	Portsmouth	Lieut. George Meares Countess Bowen	Anon (1827a)
Andromeda	29 Mar 1827	England	Lieut. Burroughs [Gerard Charles Brough]	Anon (1827b)
Mariner	23 May 1827	Cork	Capt. Charles Sturt	Anon (1827c,d)
Countess of Harcourt	28 Jun 1827	Ireland	Lieut. George Sleeman; Ensign Michael Spencer	Anon (1827e)
Guilford [Guildford]	25 Jul 1827	London, Plymouth	Capt. John Douglas Forbes; Surgeon Arthur Hamilton	Anon (1827f)
Manlius	11 Aug 1827	England	Quartermaster Benjamin Lloyd	Anon (1827g)
Governor Ready	1 Sep 1827	Portsmouth	Lieut. James Fitzgerald Butler	Anon (1827h,i)
Cambridge	17 Sep 1827	Dublin	Col. Lindsay [Patrick Lindesay]	Anon (1827j)
Champion	17 Oct 1827	London	Ensign Nathaniel Reid	Anon (1827k)
Second Contingent				
Phoenix	14 Jul 1828	Spithead	Capt. Collet Barker; Lieut. William Yorke Moore	Anon (1828a)
Bussorah Merchant	26 Jul 1828	London	Ensign Walter Kennedy Child	Anon (1828b)
Mermaid	21 Aug 1828	London	Lieut. Thomas Harrison Kirkley; Ensign Farmer [John Farmer]	Anon (1828c)
Lang	21 Jan 1829	London	Captain Horatio Walpole; Ensign Maul [Lauderdale Maule]	Anon (1829a)
John	13 Sep 1829	London		Anon (1829b)
Sir Charles Forbes	27 Jul 1830 (Hobart)	London		Anon (1830a)

Mair seems to have left behind his first wife and infant child in England. In 1827, he had married Helen McKenzie (or Kenzie) in London and the following year, their child George Carey Mair was born in Canterbury, Kent (Taylor 2009; see also Pallot's Marriage Index for England: 1780–1837, online through www.ancestry.com.au). I have been unable to find any record of Helen's fate.

While in Sydney, Mair's primary responsibilities were to supply medical support to the garrison. The military hospital at the time was housed in the recently completed South Wing of the Sydney Hospital (Cummins 1974a). However, in addition to the demands on his time with the military, Mair's involvement with the Sydney Hospital included an appointment as Assistant Surgeon to the Hospital in 1830 (Cummins 1974b). The medical staff of the civilian part of the hospital at the time consisted of a Surgeon, James Mitchell (effectively the superintendent, since the Principal Surgeon, James Bowman, had been recently reclassified as Inspector of Colonial Hospitals) and an Assistant Surgeon; although the Assistant Surgeon was nominally on the hospital staff, he mostly had external duties (including medical support for the Hyde Park Barracks, Gaol, Goat Island, the Hulk, ironed gangs at Carter's Barracks and Woolloomooloo, and attendance at corporal punishments), and only when not engaged in those duties did he assist Mitchell (Cummins 1974b). The pressure of this workload on top of his military duties was clearly too much for Mair. He was replaced as Assistant Surgeon at the Civil Hospital on 5 March 1830 by Alexander Imlay (M'Leay 1830a) (although Cummins (1974b) reported Mair's successor to be George Moncrieff).

Despite this, Mair was involved in much public health work, particularly in vaccination campaigns against smallpox. Advertisements in the Sydney Gazette and New South Wales Advertiser in September 1830 (Anon 1830b) offer free vaccinations for members of the public by Mair (during "the hour from 11 to 12 daily (Sunday excepted)"), and note that he was willing to send vaccine lymph (fluid from cowpox pustules) by mail to more remote parts of the colony. Similar reports were printed in the Sydney Herald in July 1831 (Anon 1831a). In October–November 1831, Mair was sent by Governor Darling to Bathurst and Wellington to study a smallpox outbreak among the Aboriginal population, and to vaccinate the Aboriginals (Anon 1831b,c). His extensive manuscript report of his investigations has been cited by several subsequent authors (Bennett 1834, Campbell 1983, Carey and Roberts 2002). In the following year Mair, Bowman and Imlay examined the person purported to have initiated an outbreak among Aboriginals at Port Macquarie (Anon 1832b).

He was also involved (Anon 1832c) with the Sydney Dispensary, a private charity for outpatients and domiciliary care of paupers (Cummins 1974a).

While the 39th Regiment was sent from Sydney to India in 1832 (Cannon 1853), Mair returned to London, leaving Sydney on 21 February 1833 on board the brig "Mail" (Anon 1833).

The year following his return to England, he was transferred, first on 13 June 1834 to the 56th Regiment of Foot (Anon 1834a), then, with promotion from Staff Assistant Surgeon to Assistant Surgeon, to the 59th Regiment of Foot (18 July 1834, Anon 1834b), and commenced service in the Mediterranean. The 59th Regiment arrived in Malta in June 1836 and departed for Corfu in April 1840 (Bidmead 2014). While in Malta, Mair married his second wife, Esther Ellary (b. 1818 Calcutta), daughter of a quartermaster in the regiment, on 26 April 1838 (Taylor 2009, Bidmead 2014), and a daughter, Esther Caroline, was born there the following year.

On 30 October 1840 Mair was transferred to the 47th Regiment of Foot as Surgeon (Anon 1840), and towards the end of the following year, became Staff Surgeon Second Class (Anon 1841).

Meanwhile, Sir James McGrigor, head of the Army Medical Service, had sent Dr. John Frederick Clarke of the 51st Regiment to Hobart, Tasmania, to reorganise the colony's medical service on military lines (Rimmer 1981). Clarke requested McGrigor to supply serving medical officers to take charge of the Hobart Hospital, and Mair was sent out with two assistant surgeons. Mair arrived on 29 August 1842 with his wife, daughter and son, on board the "Haidee" (Anon 1842a). Later in the same year, he was appointed a member of the Court of Medical Examiners in Tasmania (Anon 1842b). However, he soon suffered a life-threatening illness (Hobart had had a serious outbreak of typhoid in 1840) and had to return home. While Rimmer (1981) reports that Mair left Hobart towards the end of 1842, there are reports of cases seen by him in Hobart as late as 11 May 1843 (Bostock 1968), so it was probably at the end of 1843 that he left.

Whenever it was that he returned to England, Mair was subsequently posted to Kingston, Ontario, in Canada, arriving there no later than 1847 (Burns 1861) and remained there until 1850, when he returned to England via the troop ship "Resistance" (Mair 1861). His return to England coincided with his final promotion, to Staff-Surgeon First Class, on 2 August 1850 (Anon 1850). During the time in Ontario, a second daughter, Hannah, was born in 1849 (Taylor 2009), at the time of a cholera outbreak, on which he reported (Mair 1849).

Mair's illness in Tasmania is purported to have converted him to religious fundamentalism (Burns 1861) and he became a fervent supporter of the Temperance movement. His religious affiliations are evident in the next report of his activities. Following the disappearance of the Arctic Exploring Expedition under Sir James Franklin, former Governor of Tasmania, the Tasmanian press maintained a keen interest in the many searches for the expedition. A report in *The Courier* (Hobart) for 17 September 1851 (Anon 1851) noted that Mair, now stationed in Cork in Ireland, had arranged for the donation of bibles and other tracts from the Bible Society to support the expeditions sent in search of Franklin.

On 21 September 1852, at age 54, Mair retired at half-pay (Anon 1852). This was reported under the heading "Hospital Staff" in the Tasmanian press of 12 February 1853 (Anon

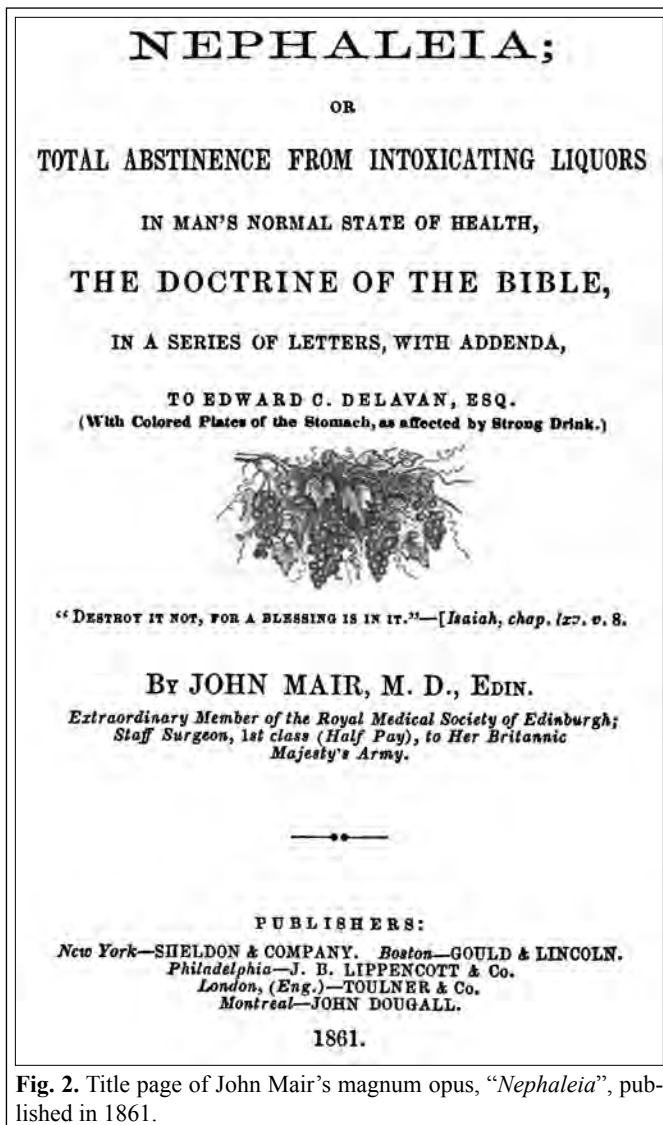


Fig. 2. Title page of John Mair's magnum opus, "*Nephaleia*", published in 1861.

1853), implying that he had returned to Tasmania sometime in the past year, but as the reference in Tasmania appeared over four months after his retirement, it is more probable that the local press was reporting events in England.

Soon after his retirement from the military, Mair returned to Kingston in Canada and set up practice there. A third daughter, Victoria, was born in 1856 (Taylor 2009). In addition to his practice, Mair also wrote extensively for Temperance Movement publications. An initial paper in the *Gospel Tribune* (Mair 1855a) was expanded and published in 1855 in Toronto for wider distribution (Mair 1855b, Morgan 1867). Four other letters followed in the *Gospel Tribune* (Mair 1856a-d). A subsequent collection of letters was published as a book five years later (Mair 1861a; Fig. 2), and other writings on the topic emanating from his pen appeared in the *Temperance Spectator* (London) and *Journal of Temperance* (Canada) (Mair 1860, 1861b, 1864a-b, 1865, Morgan 1867). In 1866, he was among the surgeons who founded the Royal College of Physicians and Surgeons at Queen's College in

Kingston (McDonald 1866). Mair died in Kingston (Connor and Harris 1993) on 5 October 1877, at the age of 79. His wife died a decade later in the same city (Taylor 2009).

However, Mair may not have confined his later years to Kingston. His son George Carey Mair had settled in Geelong, Victoria, where he was the local booking agent for Cobb and Co. coaches, and he died there in 1870 (Anon 1870a,b). On at least one occasion, John Mair may have visited his son, as "Mr J. Mair and Mr G. Mair" arrived in Hobart via the "Tasmania" from Sydney on 30 January 1857 (Anon 1857).

As Mair was no longer in the 39th Regiment by 1834, the snakes he provided to the Chatham Museum must have been donated prior to then, most likely on his return to London from Sydney in 1833. So where did Mair obtain them from? During his time in Sydney, Mair did not travel widely, and there is no evidence that he visited any part of Australia within the distribution of *Tropidonophis mairii*, which only occurs as far south as the Clarence River in northern New South Wales (Swan *et al.* 2004; Fig. 3). Hence, he must have been simply the donor of a specimen received from another source. Who could that source have been?

The most likely source is another member of the 39th Regiment. The most famous member of that regiment in Australian exploration history is Captain Charles Sturt, who traced the Castlereagh and Bogan Rivers into the Darling River in 1828, then followed the Murrumbidgee River to the Murray River, and the latter to its mouth (Sturt 1833); on returning to Australia in 1839, he led an exploration to central Australia in search of the hoped-for "inland sea" (Sturt 1849). However, Sturt's explorations did not include any travel to within the area of known distribution of *Tropidonophis mairii*.

The more likely source of the snake was Captain Collet Barker (31 December 1784–30 April 1831; see Mulvaney and Green 1994 for details of Barker's life prior to his arrival in Australia) of the 39th Regiment, who arrived in Sydney on the "Phoenix" on 14 July 1828, like Mair, as part of the second contingent. Within a month of arrival in Sydney, Barker was sent to command the recently established outpost at Fort Wellington, at Raffles Bay on the Cobourg Peninsula on the north coast of Australia. Fort Wellington was founded by James Stirling on 17 June 1827, the second European settlement on the north coast (the Fort Dundas settlement on nearby Melville Island operated between 1824–1828) and had previously been under the command of Captain Henry Smyth of the 39th (commandant from first settlement; then from November 1828 to June 1832, commandant at Port Macquarie, then to India, before returning to England; Anon 1835, Cannon 1853, Atkinson 1947) and Lieutenant George Sleeman, also of the 39th (commandant from 24 April 1828). Barker was in command of the settlement from 14 September 1828 to its closure on 29 August 1829, at which point he was sent to take over the command of the settlement of King George's Sound (later Albany) on the south coast of Western Australia (taking over from Sleeman, who had been sent there from Fort Wellington) (Mulvaney and Green 1994).

En route to Albany, Barker visited Fremantle and the Swan River settlement from 17 October to 19 November 1829, during which time he made at least one local expedition with the Governor, James Stirling, upstream along the Canning River (Wilson 1835).

The Albany settlement had been founded (as Fredericktown) by Major Edmund Lockyer, formalised on 21 January 1827, although the first landing there was on 26 December 1826. Lockyer left on 3 April 1827, leaving command to Captain Joseph Wakefield of the 39th Regiment. Wakefield passed command to Sleeman on 6 December 1828 before Barker in turn was given command (Mulvaney and Green 1994). On Sleeman's return to Sydney, he was made resident Magistrate at Illawarra from 4 February 1830 to 5 September 1832 (with a short period at Campbelltown from 1 January 1831 to 20 April 1831) (M'Leay 1830b, 1831, Organ 1997, Neate 2000). Sleeman's time in the Illawarra ended when the regiment was sent to India, where he died on 30 November 1840 (Atkinson 1947).

Barker was stationed at Albany from 29 November 1829 to 26 March 1831 (commandant from 3 December 1829 to 7 March 1831), before being recalled to Sydney by Governor Ralph Darling, with the expectation of being assigned the role of first Government Resident in New Zealand. En route to Sydney, Barker had been given the task of exploring the mouth of the Murray River, and while engaged there he was killed by local Aborigines (Mulvaney and Green 1994).

Barker's manuscript journals have been published (Mulvaney and Green 1994), and it is evident that among his interests were snakes (probably a professional interest, due to the risk of snakebite to people under his command at the two remote outposts). He first noted snakes within a month of his arrival at Fort Wellington (entry for 14 October), and subsequently reported snakes (or legless lizards in some cases) on 11, 19, 20, 25 and 27 December, 23, 24, 25 and 31 January, 2 and 6 February, 8 March, 31 May, and 2 and 5 July. From 25 December, Barker began recording ventral and subcaudal scale counts for many of the snakes seen. At Albany, Barker noted snakes on 21 March 1830, 19 April, 3 and 11 May, 30 September, 3, 4, 6, 10, 15, 16 and 17 October, 11 and 16 November, and 16, 17 and 19 January 1831, although he did not provide scale counts for most of these.

Barker's possessions were taken to Sydney after his death (as he was en route there by ship at the time) and they would have been passed onto his regiment. His manuscript diary remained in Sydney, and is lodged in the State Archives (Mulvaney and Green 1994). Any personal possessions probably returned to England with regimental staff, and Mair, with medical training that included natural history, was a likely person to transport any natural history specimens, particularly as most of the rest of the regiment were transferred directly from Sydney to India. The four snake species noted by Gray (1841) as being obtained from Mair uniquely fit Barker's movements (Fig. 3). *Tropidonophis mairii* is a common species in the Top End of the Northern Territory (Cogger and Lindner 1974). The



Fig. 3. Distribution of *Tropidonophis mairii* in Australia, and the major locations associated with John Mair (1 = Sydney; 2 = Bathurst; 3 = Port Macquarie; 4 = Hobart) and Collet Barker (A = Fort Wellington; B = Perth; C = Albany).

second species, *Calamaria diadema* (now *Furina diadema*), appears to have been misidentified by Gray (1841). From the accompanying illustration, which shows a dark rostral patch separated from the dark occipital patch, then a wide pale nuchal band followed by a third dark band, together with divided preanal and subcaudal scales and a short tail, the species involved is *Neelaps bimaculatus*, a species restricted to south-western Australia, and not described until 1854 (Cogger *et al.* 1983; Fig. 4). While it approaches the Albany area, it does not reach Albany itself, and Barker did not make any inland expeditions to within the known range of the species during his time in Albany. However, the species is common on the Perth coastal plain (Bush *et al.* 2007), visited by Barker for a month in 1829. A third species, *Trimesurus olivaceus*, described as new by Gray, is now considered a synonym (Coventry and Rawlinson 1980) of *Elapognathus coronatus* (Schlegel 1837), a species also of south-western Australia and common in the Albany district (Bush *et al.* 2007). Indeed, Barker's journal described collecting what was undoubtedly this species on 11 May 1830, and probably the same species on 21 March. The fourth species listed by Gray as "*Naja bungaroides* var." may also have come from Albany. Although the Broad-headed Snake, *Hoplocephalus bungaroides*, is a rare elapid restricted to the Sydney area, the description provided by Gray of the preserved specimen (brown, with a few whitish cross-bands, ventrals and adjacent lateral scales whitish, ventrals black anteriorly, single subcaudal scales, round pupil, lower temporal shield in the labial row) more closely fits the south-western population, *Notechis scutatus occidentalis*, of the Tiger Snake than the Broad-headed Snake (Fig. 5). The lower primary temporal scale (temporolabial scale of some authors) reaches the

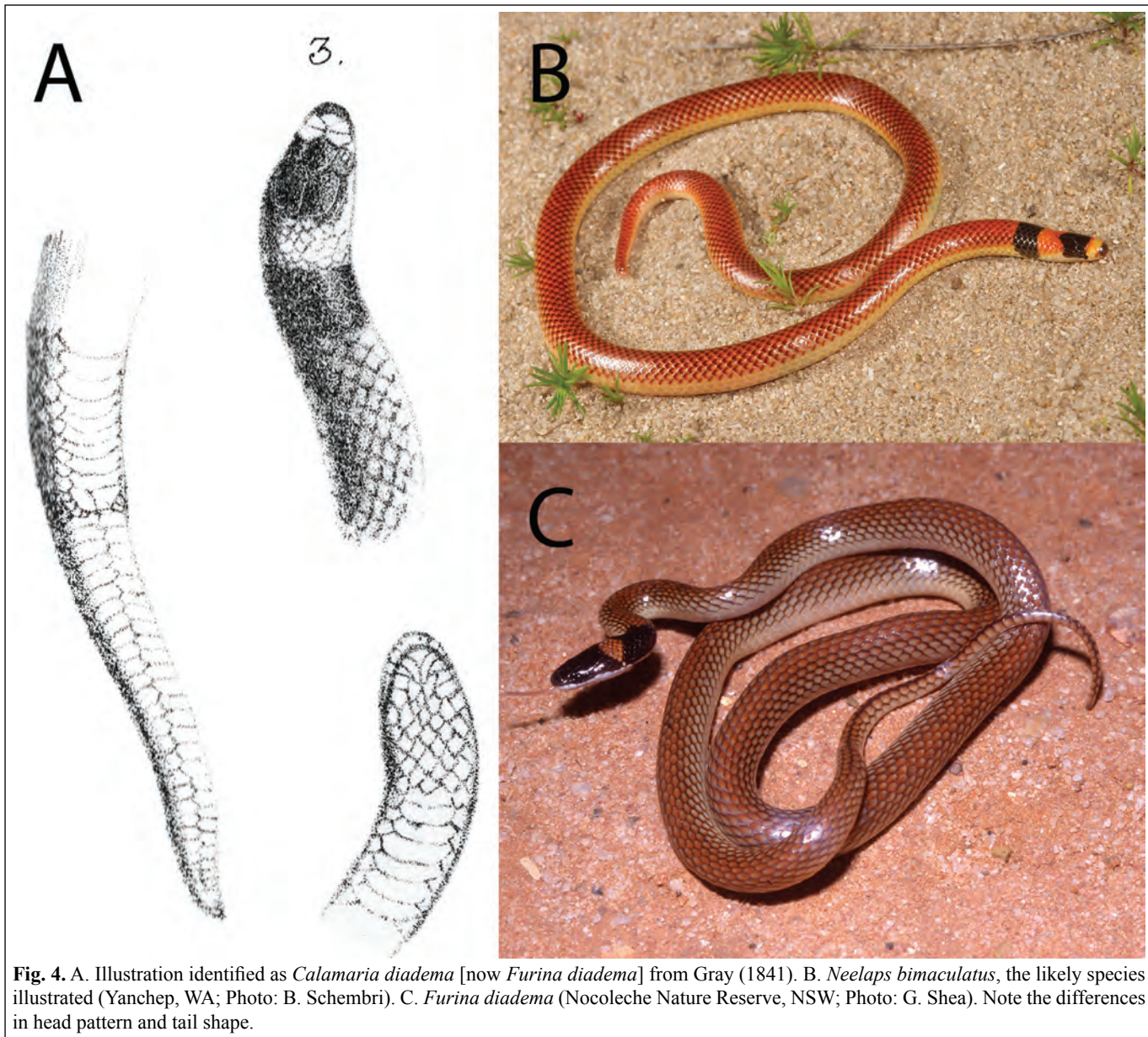


Fig. 4. A. Illustration identified as *Calamaria diadema* [now *Furina diadema*] from Gray (1841). B. *Neelaps bimaculatus*, the likely species illustrated (Yanchep, WA; Photo: B. Schembri). C. *Furina diadema* (Nocoleche Nature Reserve, NSW; Photo: G. Shea). Note the differences in head pattern and tail shape.

lip in 23% of individuals of this subspecies (Storr 1982). The Tiger Snake was not formally named until 1861 (Rawlinson 1991), and the south-western subspecies not until 1948.

Of the other officers who were based in Fort Wellington and who could have supplied the Keelback, Smyth was sent to Port Macquarie rather than south-west Australia after his time at Fort Wellington, and hence could not have collected specimens from south-western Australia, while Sleeman, although based at both Fort Wellington and Albany, did not spend time in the Swan River settlement, which was not founded until mid 1829. Assistant Surgeon Robert Martin Davis, who worked at both Fort Wellington and Albany with Barker, went directly from Sydney to India in 1832, and died there of cholera in early October 1839 (Cannon 1853).

The final link in the chain between the collection of *Tropidonophis mairii* by Barker in 1828–29, its transport to Syd-

ney by John Mair in 1832, and its description by John Gray of the British Museum in 1841, is the Chatham Museum. This was the Museum of the Army Medical Service, based at Fort Pitt, Chatham, in north-east Kent, containing extensive natural history and pathology collections, established in 1816 by Sir James McGrigor for the training of new appointees to the Army Medical Service in all aspects of natural history (Kaufman 2006). At the time of Mair's initial training at Chatham in 1821, the museum was relatively new. By 1832, just before Mair's return to England, the natural history collection had grown to 2718 specimens, and by 1838, there were 9386 zoology specimens alone (Kaufman 2006). The growth of the museum was by donation of material by the Army Medical Service's members, who before leaving Chatham had to take an examination in natural history, and were requested to collect examples of the local fauna for the Museum's collection



Fig. 5. A–B. *Notechis scutatus occidentalis* (A. Perth, WA; Photo: D. Lettoof; B. Lake Muir, WA; Photo: M. Peterson). C–D. *Hoplocephalus bungaroides* (Heathcote National Park, NSW; Photos: J. Luke); Compare dorsal and ventral markings. There is variation in the expression of narrow pale bands in the dorsal pattern in *N. s. occidentalis*—the illustrated individuals span much of the range of variation.

at their postings (Ackroyd *et al.* 2006). However, the material donated to the Museum needed identification. In the absence of herpetologically-knowledgeable staff at the time, McGrigor's Museum would have relied upon John Gray of the British Museum, an experienced herpetologist, to identify the material. Unfortunately, with the retirement of McGrigor's successor, Sir Andrew Smith, a keen naturalist, in 1858, and the transfer of the Army Medical School to Netley in 1863, the natural history collections at Chatham were dispersed or destroyed (Kaufman 2006, Ackroyd *et al.* 2006).

With Collet Barker now identified as the probable source of the holotype of *Tropidonotus mairii*, and the type locality recognised as Fort Wellington in Raffles Bay, just 32 km from Victoria, Port Essington (the second colony on Cobourg Peninsula, established October 1838; Calaby 1974), the type locality of Gray's 1842 species *Tropidonotus australis*, it is evident that the description of two different species from snake material from adjacent localities represented an error of judgement on the part of Gray.

It is ironic that the only lasting memorial to John Mair, surgeon and fundamentalist Christian, is a snake, symbol of physicians but despised in the Bible, and moreover a snake that he was not directly involved in collecting. Conversely, Collet Barker, the collector of at least four snake species, all unknown to science at the time of collection, is not honoured by an eponym in herpetology.

ACKNOWLEDGMENTS

I am grateful to Professor Laurence Brockliss, Magdalen College, Oxford University, for provision of biographical details of John Mair from his database of army surgeons. Photographs of live snakes used in the figures were kindly supplied by Damian Lettoof, Jason Luke, Magnus Peterson and Brendan Schembri. Aaron Bauer provided the scan in Figure 4 from an original copy of Gray (1841) in his library.

REFERENCES

- A., Marcus, L. Brockliss, M. Moss, K. Retford and J. Stevenson. 2006. *Advancing with the Army. Medicine, the Professions, and Social Mobility in the British Isles, 1790–1850*. Oxford University Press, Oxford. xv, 393 p.
- Anonymous. 1824. Theses of those who have graduated at the University of Edinburgh, from 1726 to 1823. *Edinburgh Medical and Surgical Journal*. 20:367–395.
- Anonymous. 1826a. The Army. *Sydney Gazette and New South Wales Advertiser*. 22 February 1826:3.
- Anonymous. 1826b. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 10 June 1826:2.
- Anonymous. 1826c. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 9 August 1826:2.
- Anonymous. 1826d. Ship News. *Colonial Times and Tasmanian Advertiser*. 18 August 1826:2.

- Anonymous. 1826e. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 13 September 1826:2.
- Anonymous. 1826f. Postscript. *Sydney Gazette and New South Wales Advertiser*. 13 September 1826:3.
- Anonymous. 1826g. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 20 September 1826:2.
- Anonymous. 1826h. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 1 November 1826:2.
- Anonymous. 1826i. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 29 November 1826:2.
- Anonymous. 1826j. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 27 December 1826:2.
- Anonymous. 1827a. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 14 February 1827:2.
- Anonymous. 1827b. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 31 March 1827:2.
- Anonymous. 1827c. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 25 May 1827:2.
- Anonymous. 1827d. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 28 May 1827:2.
- Anonymous. 1827e. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 29 June 1827:2.
- Anonymous. 1827f. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 27 July 1827:2.
- Anonymous. 1827g. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 13 August 1827:2.
- Anonymous. 1827h. Ship News. *Colonial Times and Tasmanian Advertiser*. 3 August 1827:2.
- Anonymous. 1827i. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 3 September 1827:2.
- Anonymous. 1827j. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 19 September 1827:2.
- Anonymous. 1827k. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 19 October 1827:2.
- Anonymous. 1828a. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 16 July 1828:2.
- Anonymous. 1828b. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 26 July 1828:2.
- Anonymous. 1828c. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 22 August 1828:2.
- Anonymous. 1828d. Ship News. *Sydney Gazette and New South Wales Advertiser*. 17 November 1828:3.
- Anonymous. 1828e. Trade and Shipping. *Hobart-Town Courier*. 8 November 1828:2.
- Anonymous. 1829a. Shipping Intelligence. *Sydney Gazette and New South Wales Advertiser*. 24 January 1829:2.
- Anonymous. 1829b. Sydney. *Hobart-Town Courier*. 17 October 1829: 4.
- Anonymous. 1830a. Ship News. *Colonial Times (Hobart)*. 30 July 1830:2.
- Anonymous. 1830b. [Advertisement]. *Sydney Gazette and New South Wales Advertiser*. 11 September 1830:1.
- Anonymous. 1831a. Domestic Intelligence. *Sydney Herald*. 25 July 1831:4.
- Anonymous. 1831b. Domestic Intelligence. *Sydney Herald*. 31 October 1831:4.
- Anonymous. 1831c. Domestic Intelligence. *Sydney Herald*. 28 November 1831:4.
- Anonymous. 1832a. Died. *Sydney Gazette and New South Wales Advertiser*. 17 April 1832:3.
- Anonymous. 1832b. [untitled]. *Sydney Gazette and New South Wales Advertiser*. 3 January 1832:3.
- Anonymous. 1832c. Sydney Dispensary. *Sydney Gazette and New South Wales Advertiser*. 10 March 1832:1.
- Anonymous. 1833. Shipping Intelligence. *Sydney Herald*. 21 February 1833:2.
- Anonymous. 1834a. War-Office, 13th June 1834. *London Gazette* (19164):1108.
- Anonymous. 1834b. War-Office, 18th July 1834. *London Gazette*. (19174):1354.
- Anonymous. 1835. Report from the Select Committee on Colonial Military Expenditure; together with the minutes of evidence, and an appendix and index. Pp. i–iv, 1–144 in: *Great Britain, Parliament, House of Commons. Reports from Committees (2) Army (Colonies); Consuls; Militia; General Darling. Session 19 February – 10 September 1835. Vol. 6.*
- Anonymous. 1840. War-Office, 30th October 1840. *London Gazette*. (19909):2377–2379.
- Anonymous. 1841. War-Office, 28th December 1841. *London Gazette*. (20055):3347–3348.
- Anonymous. 1842a. Arrival. *Colonial Times (Hobart)*. 30 August 1842:3.
- Anonymous. 1842b. The Gazette. *Colonial Times (Hobart)*. 6 December 1842:4.
- Anonymous. 1850. War-Office, 2nd August 1850. *London Gazette*. (21123):2132.
- Anonymous. 1851. The Franklin Expedition. *The Courier (Hobart)*. 17 August 1851:3.
- Anonymous. 1852. War-Office, 21st September 1852. *London Gazette*. (21360):2527–2528.
- Anonymous. 1853. Hospital Staff. *Courier (Hobart)*. 12 February 1853:3.
- Anonymous. 1857. Shipping Intelligence. *Hobart Town Mercury*. 4 February 1857:2.
- Anonymous. 1870a. Country News. *The Argus (Melbourne)*. 9 May 1870:7.
- Anonymous. 1870b. Family Notices. *The Argus (Melbourne)*. 10 May 1870:4.
- Atkinson, C. T. 1947. *The Dorsetshire Regiment. The Thirty-Ninth and Fifty-Fourth Foot and the Dorset Militia and Volunteers. Vol. I. The Thirty-Ninth*. Privately printed at Oxford University Press, Oxford. xviii, 355 p.
- Bennett, G. 1834. *Wanderings in New South Wales, Batavia, Pedir Coast, Singapore, and China; being the journal of a naturalist in those countries, during 1832, 1833, and 1834*. 2 Vols. Richard Bentley, London. xv, 441, vii, 428. [Facsimile, Libraries Board of South Australia, Adelaide].
- Bidmead, S. 2014. Malta Family History. Accessed October 2020.
- Bostock, J. 1968. *The Dawn of Australian Psychiatry*. Mervyn Archdall Medical Monograph (4). Australian Medical Association, Sydney. 219 p.
- Boulenger, G. A. 1893. *Catalogue of the Snakes in the British Museum (Natural History). Volume I., containing the families Typhlopidae, Glauconiidae, Boidae, Ilysiidae, Uropeltidae, Xenopeltidae, and Colubridae Aglyphae, part*. Trustees of the British Museum (Natural History), London. xiii, 448 p., xxviii plates.
- Burns, R.F. 1861. Introductory letter. Pp. 3–4 in: Mair, J. 1861. *Nephaleia; or Total Abstinence from Intoxicating Liquors in Man's Normal State of Health, the Doctrine of the Bible, in a Series of Letters, with Addenda, to Edward C. Delavan, Esq. (With Colored Plates of the Stomach, as affected by Strong Drink)*. Sheldon & Co., New York.
- Bush, B., B. Maryan, R. Browne-Cooper, and D. Robinson. 2007. *Reptiles and Frogs in the Bush: Southwestern Australia*. University of Western Australia Press, Crawley. ix, 302 p.

- Calaby, J. H. 1974. Historical background. Pp. 7–19 in: H. J. Frith and J. H. Calaby (Editors), *Fauna Survey of the Port Essington District, Cobourg Peninsula, Northern Territory of Australia*. CSIRO Division of Wildlife Research Technical Paper (28).
- Campbell, J. 1983. Smallpox in Aboriginal Australia, 1829–31. *Historical Studies*. 20(81):536–556.
- Cannon, R. 1853. *Historical record of the Thirty-Ninth, or the Dorsetshire Regiment of Foot: containing an account of the formation of the regiment in 1702, and of its subsequent services to 1853*. Parker, Furnivall, and Parker, London. xii, 128 p.
- Carey, H. M. and D. Roberts. 2002. Smallpox and the Baiame Waganna of Wellington Valley, New South Wales, 1829–1840: The earliest nativist movement in Aboriginal Australia. *Ethnohistory*. 49(4):821–869.
- Cogger, H. G., E. E. Cameron, and H. M. Cogger. 1983. *Zoological Catalogue of Australia. Vol. 1. Amphibia and Reptilia*. Australian Government Printing Service, Canberra. vi, 313 p.
- Cogger, H. G. and D. A. Lindner. 1974. Reptiles and Frogs. Pp. 63–107 in: H. J. Frith and J. H. Calaby (Editors), *Fauna Survey of the Port Essington District, Cobourg Peninsula, Northern Territory of Australia*. CSIRO Division of Wildlife Research Technical Paper (28).
- Connor, J. J. and J. Harris. 1993. Estate records of health practitioners in Ontario, 1793–1900. *Canadian Bulletin of Medical History*. 10:115–143.
- Coventry, A. J. and P. A. Rawlinson. 1980. Taxonomic revision of the elapid snake genus *Drysdalia* Worrell 1961. *Memoirs of the National Museum of Victoria*. (41):65–78, pl. 12.
- Cummins, C. J. 1974a. The Colonial Medical Service. II. The administration of the convict hospitals of New South Wales. *Modern Medicine of Australia*. January 21 1974:11–25.
- Cummins, C. J. 1974b. The Colonial Medical Service. I. The General Hospital, Sydney 1788–1848. *Modern Medicine of Australia*. January 7 1974:11–25.
- Gray, J. E. 1841. A Catalogue of the Species of Reptiles and Amphibia hitherto described as inhabiting Australia, with a description of some New Species from Western Australia, and some remarks on their geographical distribution. Pp. 422–449 in: G. Grey, *Journals of two expeditions of discovery in North-west and Western Australia, during the years 1837, 38, and 39, Under the Authority of Her Majesty's Government. Describing many newly discovered, important, and fertile districts, with observations on the moral and physical condition of the Aboriginal inhabitants, &c. &c. Vol. 2*. T. and W. Boone, London.
- Gray, J. E. 1842. Description of some hitherto unrecorded species of Australian reptiles and batrachians. Pp. 51–57 in: J. E. Gray (Editor), *Zoological Miscellany*. Treuttel, Würtz & Co., London.
- Kaufman, M. H. 2006. Post-Peninsular War activities of Sir James McGrigor (1771–1858), Wellington's Director-General of the Army Medical Department. *Journal of Medical Biography*. 14(1):23–29.
- Kraus, F. and A. Allison. 2004. A new species of *Tropidonophis* (Serpentes: Colubridae: Natricinae) from Fergusson Island, Papua New Guinea. *Proceedings of the Biological Society of Washington*. 117:303–310.
- Lee, I. 1906. *The coming of the British to Australia 1788 to 1829*. Longmans, Green, and Co., London. xvii, 350 p.
- MacDonald, [J. A.] 1866. *Bill. An Act to Incorporate the Queen's College of Physicians and Surgeons, Kingston*. Hunter, Rose & Co., Ottawa. 2 p.
- M'Leay, A. 1830a. Government Order. *Sydney Gazette and New South Wales Advertiser*. 6 March 1830:3.
- M'Leay, A. 1830b. Government Order. *Sydney Gazette and New South Wales Advertiser*. 30 December 1830:2.
- M'Leay, A. 1831. Government Order. *Sydney Gazette and New South Wales Advertiser*. 23 April 1831:1.
- Mair, J. 1819. *De peste, ejusque relationibus morbidis*. Thesis, University of Edinburgh. 36, 6 p.
- Mair, J. 1849. Saline treatment of cholera. *Medical Times*. 20:428.
- Mair, J. 1855. Observations on the text 'Ye cannot drink the cup of the Lord and the cup of devils.' *Gospel Tribune for Alliance and Intercommunion throughout Evangelical Christendom*. 2(7):173–178.
- Mair, J. 1855. "The Cup of the Lord," not "The Cup of Devils". Robert Dick (Gospel Tribune), Toronto. 21 p. [not seen]
- Mair, J. 1856a. The communion wine question. *Gospel Tribune and Christian Communist, a Monthly Interdenominational Journal*. 3(3):68–77.
- Mair, J. 1856b. Letter II. *Gospel Tribune and Christian Communist, a Monthly Interdenominational Journal*. 3(5):127–135.
- Mair, J. [as J.M.] 1856c. Fragmentary illustrations of "Cup of Devils." No. 1. *Gospel Tribune and Christian Communist, a Monthly Interdenominational Journal*. 3(7):193–197.
- Mair, J. 1856d. Reply to G. W. on the communion wine question. *Gospel Tribune and Christian Communist, a Monthly Interdenominational Journal*. 3(9):244–247.
- Mair, J. 1860. Letter to the Dean of Carlisle. *Temperance Spectator*. 2:86–88.
- Mair, J. 1861a. *Nephaleia; or Total Abstinence from Intoxicating Liquors in Man's Normal State of Health, the Doctrine of the Bible, in a Series of Letters, with Addenda, to Edward C. Delavan, Esq. (With Colored Plates of the Stomach, as affected by Strong Drink)*. Sheldon & Co., New York. 303 p.
- Mair, J. 1861b. Second letter to the Very Rev. the Dean of Carlisle. *Temperance Spectator*. 3(4):58–61.
- Mair, J. 1864a. The medical profession in relation to the temperance movement. Second paper. *Journal of Temperance, a Monthly Periodical*. (6):88–90. [First paper not located]
- Mair, J. 1864b. The right and wrong elements of the Lord's supper. *Journal of Temperance, a Monthly Periodical*. (8):120–122.
- Mair, J. 1865. Correspondence. *Journal of Temperance, a Monthly Periodical*. (10):147.
- Malnate, E. V. and G. Underwood. 1988. Australasian natricine snakes of the genus *Tropidonophis*. *Proceedings of the Academy of Natural Sciences of Philadelphia*. 140(1):59–201.
- Morgan, H. J. 1867. *Bibliotheca Canadensis: or a manual of Canadian literature*. G.E. Desbarats, Ottawa. xiv, 411 p.
- Mulvaney, J. and N. Green. 1994. *Commandant of Solitude. The Journals of Captain Collet Barker 1828–1831*. Melbourne University Press at the Miegunyah Press, Melbourne. xviii, 431 p.
- Neate, L. 2000. Alexander Harris—a mystery no more. *Journal of the Royal Australian Historical Society*. 86(2):197–212.
- Organ, M. 1997. *The mystery of Alexander Harris, Incognito, in Australia 1826–40*. Viewed October 2020.
- Rawlinson, P. A. 1991. Taxonomy and distribution of the Australian tiger snakes (*Notechis*) and copperheads (*Austrelaps*) (Serpentes, Elapidae). *Proceedings of the Royal Society of Victoria*. 103(2):125–135.
- Rimmer, W. G. 1981. *Portrait of a Hospital. The Royal Hobart*. Royal Hobart Hospital, Hobart. ix, 328 p.
- Shea, G. M. 1990. On the status of *Katophis plumbea* Macleay (Serpentes: Colubridae). *Journal of Herpetology*. 24(3):313–314.

- Smith, J. and J. Balfour Paul. 1915. *Monumental inscriptions in St. Cuthbert's Churchyard, Edinburgh. [Older portion]*. Scottish Record Society, Edinburgh. vi, 153 p.
- Storr, G. M. 1982. The genus *Notechis* (Serpentes: Elapidae) in Western Australia. *Records of the Western Australian Museum*. 9(4):325–340.
- Sturt, C. 1833. *Two expeditions into the Interior of Southern Australia, during the years 1828, 1829, 1830 and 1831: with observations on the soil, climate, and general resources of the Colony of New South Wales*. 2 Vols. Smith, Elder & Co., London. lxxx, 219, vi, 271 p.
- Sturt, C. 1849. *Narrative of an expedition into Central Australia, performed under the Authority of Her Majesty's Government, during the years 1844, 5, and 6. Together with a notice of the Province of South Australia, in 1847*. T. and W. Boone, London. x, 416, vi, 308, 92 p.
- Swan, G., G. Shea and R. Sadlier. 2004. *A Field Guide to Reptiles of New South Wales. Second Edition*. Reed New Holland, Sydney. 302 p.
- Taylor, J. M. 2009. *From Aberdeenshire to the ends of the Earth*. Viewed Oct 2020.
- Waterston, C. D. and A. M. Shearer. 2006. *Former Fellows of the Royal Society of Edinburgh 1783–2002. Biographical Index Part Two*. Royal Society of Edinburgh, Edinburgh. 538 p.
- Wilson, T. B. 1835. *Narrative of a voyage round the World; comprehending an account of the wreck of the ship "Governor Ready," in Torres Straits; a description of the British settlements on the coasts of New Holland, more particularly Raffles Bay, Melville Island, Swan River; and King George's Sound; also, the manners and customs of the aboriginal tribes; with an appendix, containing remarks on transportation, the treatment of convicts during the voyage, and advice to persons intending to emigrate to the Australian colonies*. Sherwood, Gilbert, & Piper, London. xv, 349 p. [reprinted 1968, Dawsons of Pall Mall, London].

We suggest the following format for citing this article:

Shea, G. M. 2021. Dr. John Mair, Captain Collet Barker, and the discovery of the Australian Keelback, *Tropidonophis mairii* (Serpentes, Colubridae). *Bibliotheca Herpetologica* 15(3):18–28.

Book Review

**The Lost Species: Great Expeditions in the
Collections of Natural History Museums**

Christopher Kemp, 2017. The University of Chicago Press, xxi, 250 p.

\$30.00 (hardback, ISBN: 9780226386218), \$21.00 (paperback,
ISBN: 97802265137606), and \$21.00 (e-book, ISBN: 9780226386355).

Eric J. Hilton

Virginia Institute of Marine Science, William & Mary
Gloucester Point, VA 23185, USA. ehilton@vims.edu

*"This is exactly how natural history collections are supposed to work.
The specimens...represent a conversation that takes place over the centuries."* (p. 197)

*"This is why the collections are so important. None of them is complete. But when a specimen
becomes part of a collection, it begins another life – a second life as a representative."* (p. 139)

Many books and articles that extoll the virtues of museums and specimen-based science have some form of a statement of purpose that reads something like the following: a primary goal of this book is to dispel the view that museums are dark, dusty warehouses that are home to specimens and scientists that are equally dusty. Many of these books, even those written in a more popular style, reach an audience of primarily scientists, and few are engaging enough to capture the imagination of those outside of biological circles. Simply, few serve to expand the number of converts for which the choir is singing. Christopher Kemp's *The Lost Species* is, in contrast, one such book that not only is written so that the scientist, dusty or not, can draw inspiration from it, but is engaging enough to capture the imagination of the general public and show that there is a great sense of discovery in museum research and in taxonomy. The reader learns the history that goes behind specimens, the history of exploration long ago in regions most will not set foot. In doing so, Kemp brings to focus the primary source of our understanding of the biological world, specimens, and the importance of the institutions that house and care for these objects, museums, as exemplified by the two quotes used as epigraphs.

Over the course of 200+ pages, Kemp offers vignettes into alpha taxonomy—the primary discovery and description of species, which are the fundamental units of comparative biology. Each chapter focuses on an example of a species that was identified by science for the first time based on specimens (or more often than not, a single specimen) long—in some cases a century or two—after those specimens were collected. There is something in these chapters for everyone,

including history, science, and the personality of the researchers. For readers of this journal, the historical accounts will be of particular interest. No matter whether the topic species is herpetological or not, the descriptions of the historical expeditions are relevant to many organismal persuasions. This stems, of course, from the fact that many of the expeditions took place at a time in history, for better or worse, marked by colonialism and (mostly) European expansion and its associated general collecting expeditions, as colonial powers sought to inventory natural resources of their far reaching, claimed territories. Kemp does confront this unfortunate history of collecting a bit, particularly as related to the establishment of the Royal Museum for Central Africa in Tervuren, Belgium by King Leopold II following a bloody occupation of the Congo (p. 119). Museums and specimen-based science does need to come to terms with this history, though that could be the topic of a book unto itself. It is notable and laudable that Kemp does promote, by example, diversity among taxonomists, particularly along gender lines; scientists from underrepresented groups still are, well, underrepresented.

The accounts are short—the chapters average 7.5 pages, with the longest being only 11 pages; each is accompanied by a black and white photo of the topic specimen, the researcher, or a related historical photograph. If one criticism can be levied, it is that the taxonomic focus is a bit unbalanced. Of the 25 chapters, five focus on mammals, none on birds (!), two on amphibians, two on fishes, seven on insects, three on crustaceans, and only a single chapter each on reptiles, arachnids, worms, plants, and a fossil (a dinosaur, of course!); there is also one anthropological chapter. All of the examples Kemp uses come from researchers based at, or using, major museum such as the Natural History Museum (London) and the

*Great Expeditions in the Collections
of Natural History Museums*

the
LOST
species



Smithsonian Institution's National Museum of Natural History (Washington, D.C.). These centers of taxonomy, of course, have a long history of collecting, and therefore are primed for examples of species discovery among their shelves. It would have been nice to have some examples from smaller collections, if only for taxonomists at such institutions to have to point to their administrators as examples of their importance. Again, all of these accounts are entertaining and give the reader a sense of adventure and discovery. Additionally, Kemp's writing is approachable and entertaining, moving between evocatively descriptive, poignant, and humorous. Some of my favorite passages, which I hope capture what I mean by this, are the following.

On habitats:

"On Google Earth, the Bird's Head Peninsula is a wide green place. A small fleet of white clouds drifts above it like empty speech bubbles, a pan-flat coastal plain is punctuated with a

procession of river deltas that curlicue southward, emptying into the ocean along the length of the coastline—blue rivers narrowing, snaking, and dwindling to the north, as delicate as calligraphy. It is wet and riverine, divided and bifurcated by the irregular serpentine tracings of a hundred waterways." (p. 42–43)

On field work:

"His work in the field—months beneath the canopy in rainforests across Central Africa—only provides the raw material. The specimens are questions. The collections provide the answers." (p. 198)

On taxonomic intuition:

"What allowed [Blackburn] to see the part and somehow visualize the whole? Even now, Blackburn says he doesn't know. He can't explain the intuition that led him to place the specimen in a pile of its own. A pile of one. What details separated one unremarkable frog—brown and shriveled after eighty years in alcohol—from the rest?" (p. 79)

and

"The morphological differences somehow engage and activate parts of Dijkstra's brain that clearly don't work in mine, allowing him to determine their uniqueness without difficulty. 'It's something taxonomists are good at, seeing pattern, even if they can't immediately say why,' says Dijkstra—just as Blackburn did with the overlooked squeaker frog." (p. 125)

I have some minor quibbles here and there. Kemp states that "a species is nothing more than a hypothesis" (p. 26). I would argue that

the species *name* is the hypothesis, and that the species itself is probably indifferent to the name applied to it by odd-looking and largely hairless member of Hominidae. Another one is the use of "the" prior to taxonomic names (e.g., "The *Thorius* genus..."); genus and species names, are proper names and thus should not be used as an adjective. However, anyone of us could come up with equally minor criticisms for just about any book that was ever written. In the end, Kemp does a fabulous job of bringing to life the excitement, beauty, and importance that lies hidden on the shelves of the world's natural history collections. I for one am glad to have *The Lost Species* on my bookshelf, and will enjoy returning time and again to it for a dose of taxonomic inspiration.

We suggest the following format for citing this article:

Hilton, E. J. 2021. Book Review. *The Lost Species: Great Expeditions in the Collections of Natural History Museums*. *Bibliotheca Herpetologica* 15(4):29–30.

Francisco Newton's Zoological Expedition to Angola (1903–1906): Review of a forgotten expedition.

Bruna S. Santos¹ and Luis M. P. Ceríaco²

¹ Departamento de Biologia, Faculdade de Ciências da Universidade do Porto,
Rua do Campo Alegre, 4169-007 Porto, Portugal. brunascesantos@gmail.com

² Museu de História Natural e da Ciência da Universidade do Porto,
Praça Gomes Teixeira 4099-002 Porto, Portugal. lmceriaco@mhnc.up.pt

Abstract. Francisco Newton (1864–1909) was an important Portuguese naturalist who conducted several expeditions for more than 25 years during the late nineteenth and early twentieth century and who greatly contributed to the study of Portuguese overseas colonies. In 1902, Newton was nominated to undertake a zoological survey of Angola, commissioned by the Academia Politécnica do Porto (APP; precursor of University of Porto), an institution that had recently started to develop a zoological museum. Between 1903 and 1906, Newton collected several hundred zoological specimens that resulted in the description of 27 new taxa. Here we present a reconstruction of the expedition, providing georeferenced collecting localities and other historical data.

Resumo. Francisco Newton (1864–1909) foi um importante naturalista Português que no final do século XIX e início do século XX, durante mais de 25 anos, realizou várias expedições que contribuíram largamente para o estudo as colónias ultramarinas Portuguesas. Em 1902 Newton foi nomeado para um levantamento zoológico de Angola, comissionado pela Academia Politécnica do Porto (APP; precursora da Universidade do Porto), uma instituição que tinha recentemente começado a desenvolver um museu zoológico. Entre 1903 e 1906, Newton coletou várias centenas de espécimes zoológicos que resultaram na descrição de 27 novos taxa. Neste artigo apresentamos a reconstrução desta expedição e fornecemos as localidades de coleta georreferenciadas, bem como outros dados históricos.

Key words: History of Science, Natural history collections, Angolan zoology, Taxonomy; Scramble for Africa.

INTRODUCTION

Francisco Xavier Oakley de Aguiar Newton (1864–1909; Fig. 1), commonly known as Francisco Newton, was a Portuguese naturalist who dedicated his career to the exploration of several former Portuguese territories in Africa and Asia. Despite the importance of his work to the study and knowledge of fauna and flora of many African countries, his life and work remain poorly known by modern day researchers and historians of science. Only two short biographical notes were ever published about his life (Silva, 1940; Figueiredo et al., 2019), and aside from these, Francisco Newton's name is only known from the eponyms of the species described in his honor, through the labels on the specimens he collected and that are still extant in natural history collections, and in the credits/acknowledgments on the papers published by several authors who used specimens he collected. In this paper we review the history and itineraries (including collecting localities) of Francisco Newton's expedition to Angola (1903–1906) and provide a baseline for further research on the extant collections housed in the MHNC-UP.

BRIEF BIOGRAPHICAL SKETCH

Francisco Newton was born in Porto, northern Portugal, on 18 May 1864, as the second eldest son (Anonymous, 1878) of Isaac Newton (1840–1906), a Porto salesman and clerk of English and Irish descent and an amateur naturalist who actively collected for the natural history museums and herbariums of Lisbon, Coimbra and Porto (Sampaio, 1946, 1947). Among his childhood friends was Augusto Pereira Nobre (1865–1946), who would later become naturalist and director of the Zoological Museum of the Academia Politécnica do Porto (APP; Polytechnic Academy of Porto¹) from 1891 to 1935 (Nobre, 1945). Although there is no information regarding Francisco Newton's education or activities as a young man, at the young age of 16, when he embarked to the Portuguese colony of Angola (southwestern Africa) to conduct botanical surveys (Figueiredo et al., 2019) he was already fluent in English and French (Anonymous, 1892a). This expedition lasted from 1880 to late 1884 or early 1885 and can be understood as Newton's own initiative to gain experience in field work in Africa and

¹ The Academia Politécnica do Porto was elevated to become the University of Porto in 1911. The former Zoological Museum of the Academy (and later the University) is now part of the Museu de História Natural e da Ciência da Universidade do Porto (MHNC-UP).



Fig. 1. Portrait of Francisco Newton (1864–1909) (Source: Arquivo Histórico Museu Bocage).

promote himself as a naturalist (Figueiredo et al., 2019). During this trip, Newton collected extensively in the southwestern parts of Angola in the company of well-known botanical collectors and naturalists, such as the Swedish settler and explorer Axel Wilhelm Eriksson (1846–1901), the English explorer Henry Hamilton Johnston (1858–1927), the French missionary and explorer Charles Victor Aubert Duparquet (1830–1888), the Earl of Mayo, Dermot Robert Wyndham-Bourke (1851–1927) and the famous “lion-hunter” from southern Angola, Nestor da Costa (dates of birth and death unknown) (Henriques, 1885; Figueiredo et al., 2019). The results of this expedition comprised hundreds of plant specimens distributed through several herbaria across the world, as well as the description of over fifty new botanical taxa (Figueiredo et al., 2019).

After the success of his first expedition in Africa, Newton proposed a zoological mission to São Tomé and Príncipe islands to the Portuguese Government on 27 July 1885, on the behalf of the Zoological Section of the National Museum of Lisbon (Newton, 1885; Silva, 1940; Figueiredo et al., 2019). From

October 1885 to January 1892, Newton collected specimens from the Gulf of Guinea islands, as well as in the Portuguese protectorate of Dahomey (currently Benin) in 1886 (Figueiredo et al., 2019). Back in Portugal in 1892, Newton gave a conference on 30 May in his hometown, in the Ateneu Comercial do Porto, a cultural association created by clerks and merchants, to which he donated ethnographic objects that he privately collected in his previous excursions (Anonymous, 1892b). Part of these objects were sent in the early 1990’s to the Faculty of Sciences of the University of Porto and were integrated in its museum (currently Museu da História Natural e da Ciência da Universidade do Porto, MHNC-UP). After a few months in Portugal, Newton returned to the Gulf of Guinea to resume the expedition, which would last until April of 1895, with surveys in the São Tomé and Príncipe islands, Fernando Pó (currently Bioko, Equatorial Guinea) and Annobon (currently part of Equatorial Guinea) (Figueiredo, et al., 2019). After completing his commission to explore the Gulf of Guinea, Newton was re-assigned on 15 October 1895 by the Portuguese Government and the National Museum of Lisbon for another two-year mission, this time to the Portuguese colony of Timor (Anonymous, 1895). This mission lasted from 1896 to April 1897 (Anonymous, 1897; Newton, 1897). In 1898, Newton requested a new assignment for natural history surveys of the Portuguese overseas possessions (Newton, 1898), which was granted by the Government as a contract to explore Guinea-Bissau and the islands of Cabo Verde, where he stayed from 1898 to 1902, collecting specimens of fauna and flora (Figueiredo, et al., 2019). Most of the specimens collected by Newton in these expeditions were deposited in the Zoological Section of the National Museum of Lisbon (later renamed Museu Bocage), with the exception of some collections that were sent to other specialists, as the case of the malacology collections that were sent to Augusto Nobre and are still part of the collections of the MHNC-UP. Unfortunately, most of Newton collections that were housed in Lisbon, as well as the remaining zoological collections, were destroyed in the fire that engulfed Museu Bocage in 1978 (Ceriaco, 2021).

Back in Portugal, Newton was nominated for an expedition to Angola (Anonymous, 1902), commissioned by the Academia Politécnica do Porto. This expedition lasted from 1903 to 1906. After returning from the Angolan trip, Newton was assigned to a new excursion to Guinea-Bissau in 1907 (Anonymous, 1907a), which was eventually changed to Cabo Verde due to the heavy rains in the mainland colony (Anonymous, 1907b). Shortly after, his contract was terminated by the Portuguese Government, following a complaint regarding his behavior issued by the province’s governor (Anonymous, 1908a,b,c). Newton requested to be sent overseas one more time (Newton, 1909), either “to Angola or Guinea-Bissau” but the request ended up being denied (Ferreira, V. 1909) and he died months later on 9 December 1909 from a liver infection (pers. comm. from the Cemetery Offices of Matosinhos Municipality).

Francisco Newton’s collections were crucial for many of the first descriptions of fauna in São Tomé and Príncipe, Annobon, Bioko, Timor, and Cabo Verde, resulting in numerous

publications. Of the several branches of zoology, his work was particularly relevant to the study of African herpetology. José Vicente Barbosa du Bocage (1823–1907) and José Júlio Bethencourt Ferreira (1866–1948), respectively curator and assistant curator at the Zoological Section of the National Museum of Lisbon, were the two herpetologists entrusted with their identification. Between these two herpetologists, 24 new herpetological taxa were described in the various papers they authored between the years of 1886 and 1906, with Bocage describing ten species (Bocage, 1886a,b, 1887, 1890, 1893, 1895a,b) and Ferreira describing 14 (Ferreira, J.B. 1897a,b, 1898, 1904, 1906). Despite not being Newton's longest expedition, the 1903–1906 mission to Angola yielded the highest number of descriptions of new amphibian and reptile taxa the explorer ever collected in a single expedition.

MATERIALS AND METHODS

In order to review and reconstruct the itineraries (see Fig. 2) and history of the expedition, we consulted archives, the published literature and museum specimens. We focused mainly on records archived in MHNC-UP, in the Arquivo Histórico Ultramarino (AHU) and in Arquivo Histórico de Angola (AHA). As for bibliography, we consulted the published papers resulting from the study of the Newton's Angolan expedition collections (Ferreira, J.B. 1904, 1906; Nobre, 1905b; Seabra, 1905a, b, c, 1906a, b, c, 1907, 1909) as well as recent reviews done by Ceriaco et al. (2014) and Marques et al. (2018). The MHNC-UP collection specimens were examined, and all present data was cross-referenced with the internal museum databases, documentation, and the resulting papers. Locality data is hereby reported in the form of decimal degrees and uses the WGS 84 map datum (Table 1). Records derive mainly from Marques et al. (2018), from research conducted in old maps (georeferenced using GEOLocate's web application) and the website "Falling Rain". Elevations are all reported as meters above sea level.

THE ACADEMIA POLITÉCNICA DO PORTO EXPEDITION

In January 1902, while still in São Nicolau Island, Cabo Verde, Francisco Newton was informed that his commission as naturalist in Cabo Verde was about to be terminated by direct orders of the Ministry of the Navy. In a letter dated 13 January 1902 to Baltazar Osório (1855–1926), naturalist in the Zoological Section of the Natural History Museum of Lisbon, Newton expressed his concerns about this decision, and asked "where does the Government want to send a man who has been a servant of the state for 18 years?" (Newton, 1902a). In this letter, Newton also expresses his concerns about his future, denoting that he would be happy to work wherever the Government sent him: "Mozambique, India or other interesting points. I accept anything—as long as they [the Government] don't leave me without bread". In a following letter, dated 22 January 1902, Newton confirms the Ministry's decision to Baltazar Osório,

and further disclosures his precarious and grim future—the explorer planned to beg the Ministry to let him stay a few more months in Cabo Verde, even without receiving payment, as he was worried that if he were sent back to Portugal in the middle of the winter, he would eventually not make it through the season (Newton, 1902b). These letters elucidate the difficulties Newton faced as a naturalist explorer. Despite being friends with the high society of Porto, Newton's family was of modest means and he himself, as an explorer working for the Government, did not have enough savings to live a stable life in Portugal.

At the same time Newton's commission was terminated, his hometown of Porto was experiencing important developments regarding its scientific and natural history institutions. While Newton was in Africa, his childhood friend Augusto Nobre was entrusted to establish and develop a zoological museum in the Academia Politécnica do Porto, that would serve to support the natural sciences classes, but also to promote zoological research. Nobre was initially appointed as assistant professor of Zoology in 1891 and as the main naturalist of the museum in 1901 (Machado, 1946). In order to enrich its collections, but also to foster the study of the natural history of the northern regions of Portugal, the museum promoted several expeditions in the country (Nobre, 1935). After the end of his commission for the Lisbon museum in 1902, Newton returned to Porto to support his ill father (Sampaio, 1946). Given his difficult financial and personal situation, his childhood friend group arranged a way to support him. Taking advantage of the plans to enrich the collections of the Academia Politécnica do Porto, Augusto Nobre managed to assemble a group of local men of influence to hire Newton as an explorer for the museum. Newton was hired by the Academy to lead a zoological expedition to Angola to enrich its museum with new specimens and collections. The expedition was organized not only by the chair of Zoology Aarão Ferreira de Lacerda (1863–1921) and Augusto Nobre, but also by Bento de Sousa Carqueja (1860–1935), a reputable businessman from Porto, co-owner of the local newspaper *O Comércio do Porto* and at the same time naturalist and professor at the Academia Politécnica do Porto. It is probable that Carqueja himself provided funds for the expedition.

NEWTON'S 1903–1906 ANGOLA EXPEDITION

Newton's 1903–1906 expedition to Angola occurred during the later stage of the so-called "Scramble for Africa", but nevertheless yielded some of the most important collections of his career. From these collections, a total of nine amphibian taxa, one reptile and sixteen mollusks were described as new to science by his contemporaries (Ferreira, J.B. 1904, 1906; Nobre, 1905b), while two other species (one snake and one frog) have more recently been described using its specimens as type material (Hallermann et al., 2020; Ceriaco et al., in press). At the time, the colony of Angola was a growing economy, benefitting from both Portuguese and foreign investment in several industries, such as coffee, cotton plantations and fishing. Multiple railroad systems had been recently commissioned by the Portuguese Government

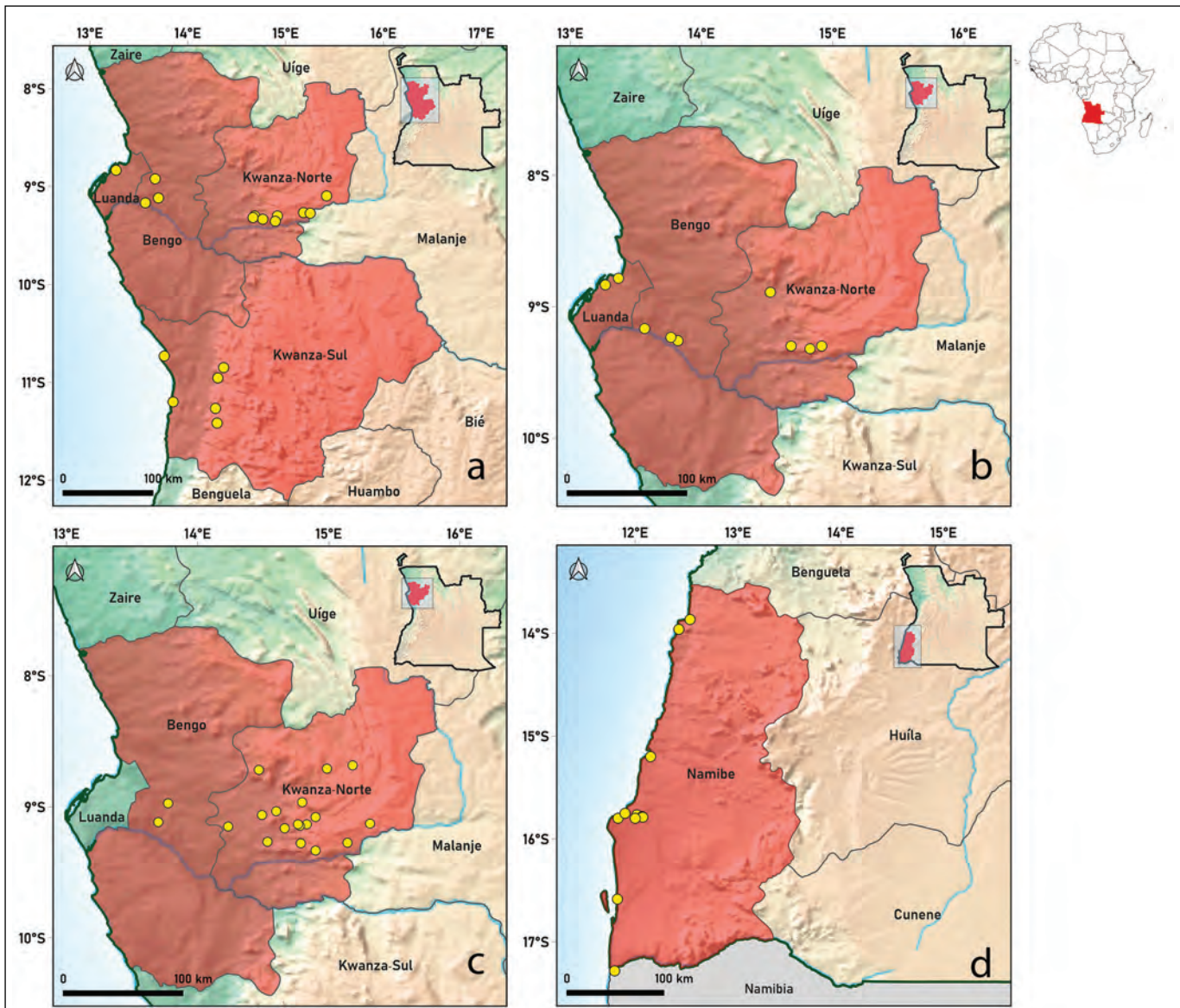


Fig. 2. Maps of collecting localities from the Newton expedition: **2a** — collecting localities from March to September 1903; **2b** — collecting localities from October to December 1903; **2c** — collecting localities from January to May 1904; **2d** — collecting localities from June 1904 to February 1905.

and were in construction or had just been inaugurated, which connected the coastal cities of Luanda, Benguela, Moçâmedes and Porto Amboim to the hinterlands. Newton's expedition was the first major zoological survey commissioned by the Portuguese Government to Angola after the death of the famous naturalist and explorer José de Anchieta (1832–1897), who explored the colony for over thirty years and greatly contributed to the knowledge of its fauna (Marques et al., 2018).

On 29 October 1902, Newton was appointed by the Portuguese Government to undertake a zoological expedition to Angola (Anonymous, 1902), in order to collect specimens for the Academia Politécnica do Porto. Newton officially started his appointment on 4 March 1903 (Anonymous, 1906a), after departing from Portugal on 6 February 1903 (Anonymous [undated] a). Not surprisingly, on the eve of his

departure to Angola, his friends (including Augusto Nobre), organized a farewell dinner for him (Brandão *in* Sampaio, 1946). Although the entry port in Angola is unknown, Newton most likely arrived in Luanda, the colony's capital. Luanda was a city undergoing major economic growth and societal changes and was starting to lose its fame as the slave trade port it had once been (Amaral, 1978). An example of that was the new railroad that connected Luanda to Ambaca-Lucala, constructed from 1886 to 1899 (Pereira, 2017; Diogo & Navarro, 2018), which had a pivotal role on the exportation of coffee crops of the Cazengo region plantations (currently Kwanza Norte Province), north of the Cuanza River (Van Dongen, 1961).

From Luanda, Newton departed directly to Novo Redondo (today known as Sumbe, capital of the Kwanza Sul Province), which he used as a base for the first part of his

Table 1. Collecting localities from Newton's Expedition.

PROVINCE	LOCALITY	LATITUDE	LONGITUDE	ELEVATION
Bengo	Bom Jesus [=Bom Jesus, Quanza]	-9.16667	13.56667	37
	Cabiri [=Lagoas pantanosas de Cabiri]	-8.92125	13.66654	31
	Cabicula, Cazengo [=Cubicula (região do Cazengo); Cabiculo, região do Cazengo]	-9.16667	13.56667	37
	Caculo, margens da lagôa, região do Quanza [=Cacullo]	-9.25921	13.82048	8
	Catete [=Cotete]	-9.11667	13.70000	21
	Caxicâne, margens do Quanza	-8.89007	14.52526	284
	Cunga [=Cunga, margens do Quanza; Lagôa do Cunha (rio Quanza); Lagoas e charcas da Lagoa Cunha, concelho de Maxima; Quanza (margens da lagôa Cunha]	-9.23333	13.76667	92
	Quissanga	-8.97310	13.77499	46
Kwanza Norte	Ambaca [=Ambaca (Pomba)]	-9.26667	15.18333	738
	Bango [=Bongo; Golungo Alto (Bango)]	-8.68330	15.18330	840
	Bango Aquitamba [=Bango Aquitambo]	-8.70839	14.98725	822
	Cacólombôlo [=Cacolombolo]	-9.12770	15.31600	849
	Camuanze [=Camanze]	-9.06230	14.49150	344
	Cambondo	-9.16349	14.66432	394
	Camilungo	-9.13333	14.83333	756
	Catari	-9.09548	15.41905	1022
	Cazengo [=Região do Cazengo]	-9.33333	14.76667	713
	Florestas de Mupepe [=Florestas de Mupépe, sob folhas secas; Mupépe; Mopepe]	-9.14472	14.78000	641
	Golungo Alto [=Gollungo Alto]	-9.13333	14.76667	666
	Hôcco [=Concelho do Cazengo (Hôcco); Hocco]	-9.35422	14.89471	573
	Lucalla	-9.27268	15.25206	708
	Luinha [=Zuinha, Rio Luinha]	-9.26667	14.53333	237
	Méso Casuco [=Messo Cassuco]	-8.96490	14.79800	979
	Monte Alegre	-8.71777	14.46778	547
	N'Dalla Tando [=N'Dalla; N'Dalla Gando; N'Dalla Tando, região do Cazengo]	-9.30000	14.91667	782
	N'Delle [=Florestas de N'Delle]	-9.15000	14.23333	208
	N'Golla Bumba [=Bumba; N'Golla Bumba, nas florestas]	-9.03333	14.60000	460
	Palmyra [=Palmyra, em Cazengo]	-9.30000	14.68333	403
	Prototipo, Cazengo	-9.32028	14.82806	652
	Quéta [=Serra de Quéta]	-9.27820	14.78777	612
	Quilombo	-9.33333	14.90000	744
	Rio Cuango [=Margens do rio Cuango; Florestas das margens do Rio Quango, no Golungo Alto]	-9.27375	15.14394	724
	Zanga	-9.07815	14.90003	721
	Zembe [=Florestas de Zembe, região do Cazengo]	-9.31667	14.66667	539

Table 1. Continued...

PROVINCE	LOCALITY	LATITUDE	LONGITUDE	ELEVATION
Kwanza Sul	Amboim, interior de Novo Redondo [=Ambuim, Serra de Selles]	-10.85000	14.36667	1052
	Chingo, Novo Redondo [=Chingo]	-11.20000	13.85000	11
	Gumba [=Gumba, Serra de Selles, interior de Novo Redondo; Gumba, 800m alt.; Região de Selles, Gumba (Novo Redondo)]	-11.26667	14.28333	784
	Lembu [=Lembu, Serra de Selles; Lembu (Lemba), Serra de Selles]	-10.95547	14.30763	733
	Novo Redondo	-11.20000	13.85000	11
	Porto Amboim	-10.73301	13.76947	52
	Serra de Selles [=Selles; Selles (Loanda); Serra de Selles (interior de Novo Redondo); Região de Selles]	-11.41667	14.30000	1005
Luanda	Cacuaco [=Cacuaco, perto Loanda]	-8.78333	13.36667	6
	Loanda [=Ilha de Loanda; Arredores de Loanda]	-8.83333	13.26667	80
Namibe	Bahia dos Tigres [=Baie des Tigres]	-16.58559	11.82709	98
	Camilunga [=Lagoa do Camilunga]	-15.80000	12.00000	48
	Coroca/Corôca [=Margem do Coroca; Margens do Rio Coroca; Rio Coroca; R. Coroca; Planícies do Rio Coroca]	-15.78333	12.06667	45
	Cunene [=Embocadura do Cunene; Foz do Cunene; Margens do Rio Cunene; Bords du Cunene; Embouchure du Cunene]	-17.28333	11.80000	82
	Lagoa do Coroca [=Lagoa do Caroca; Lagoa do Rio Coroca; margens da Lagoa do Coroca]	-15.78894	12.07353	45
	Lagoas Pinda	-15.74549	11.91301	7
	Lucira	-13.86667	12.53333	51
	Mossamedes	-15.20000	12.15000	24
	Pinda [=Porto Pinda]	-15.75148	11.90116	37
	Porto Alexandre [=Bahia de Porto Alexandre; Cabo Negro de Porto Alexandre; Península de Porto Alexandre; Port Alexandre]	-15.80401	11.84492	11
	Ungway [=Margens Ungway; Lagoa do Ungway; Lagoas Ungway; Uray]	-15.76667	12.01667	45
Undetermined	Angola	—	—	—
	Cafuxi	—	—	—
	Calunga	—	—	—
	Camanze/Camuange	—	—	—
	Cavernas Quimvanda, perto de Golungo Alto	—	—	—
	Chacuto [=Lagoa de Chacuto; margens do Lago Chacuto; margens da Lagoa do Chacuto]	—	—	—
	Dondo Anzêlle, região Quanza	—	—	—
	Encuacre, interior de Novo Redondo	—	—	—
	Florestas Kalala	—	—	—
	Florestas Kakolo	—	—	—
	Florestas margens Quanza	—	—	—

Table 1. Continued...

PROVINCE	LOCALITY	LATITUDE	LONGITUDE	ELEVATION
Undetermined	Icolo e Bengo	—	—	—
	Katála	—	—	—
	Katúla	—	—	—
	Margens da Lagoa Cumana, rio Quanza	—	—	—
	Lagoa Quitenha [=Quitenha/Quitenha (Rio Quango)]	—	—	—
	Lagoa do Tua	—	—	—
	Lucinda	—	—	—
	Monte Bello, região do Cazengo	—	—	—
	Mu-rondo	—	—	—
	N. Jumbo	—	—	—
	Quibundo	—	—	—
	Quinuanda	—	—	—
	Margens do rio Quêve [=Lué/Rio Loçué/Rio Lucué/Margens do Rio Luce]	—	—	—
	Riacho Caté	—	—	—
	Rio Quiapose [=Margens Rio Quiapose]	—	—	—
	Rio Zenga	—	—	—
	Serra de Stombe	—	—	—

expedition and where he started collecting in March 1903 (Anonymous [undated] d). Despite being a small port, Novo Redondo was an important economic market, which became particularly significant in early twentieth century, due to its role in the second wave of coffee production in Angola, mostly based on coffee crops from the *concelho* [district] of Seles (Van Dongen, 1961). Together with Porto Amboim, where Newton collected in April 1903, these were two of the most important ports for coffee exportation south of the Cuanza River (Anonymous [undated d]; Van Dongen, 1961).

On 14 May 1903, the naturalist wrote a first letter from “Gumba, Serra de Selles, Novo Redondo Province” [=Gumba] stating that he had already collected some specimens and provided an estimate of the diversity and number of specimens he thought he could collect each month (Newton, 1903a). According to his own estimations, Newton expected to collect about “three birds per day/90 per month; two amphibians and reptiles per day/60 per month; a mean of 15 to 20 mammals per month; a mean of 30 insects, mollusks, etc. per day/ 900 per month; a mean of 1065 specimens per month.” In this same letter, Newton mentions that:

“On the 12th of this month [May] I collected 80 specimens, among which four snakes, one of them of notable size—which the locals call N’Buta—and has fame of being the most venomous snake of Angola. I believe it is a *Vipera arietans*¹, and I conserved them in liquor at 22 degrees, and

mixed with 4% formalin. I had to use a barrel because of the lack of canisters. [...] Practice has shown me that 4% formalin only serves for the conservation of batrachians, fishes, insects and crustaceans. Snakes do not conserve well, neither do mammals, unless in alcohol or liquor reinforced with 4% formalin” (Newton, 1903a).

A few days before that, on 12 May 1903, Newton wrote from “Gumba” to Ignacio Bolívar (1850–1944), a renowned Spanish entomologist, to let him know that he’d collected several “orthópeteres” (grasshoppers) that would likely be sent to him for identification (Newton, 1903b). During this initial period, Newton collected several specimens of mammals (later studied and published by Seabra, 1905a, 1906a), amphibians and reptiles (later published by Ferreira, J.B. 1904), and several mollusks (later studied and published by Nobre, 1905b, some of which were new species) in the localities of Gumba, Lembu, Serra de Selles, Chingo, Amboim, Encuacre, Porto Amboim, Novo Redondo (see Table 1; see Fig. 2a). While in the region, Newton experienced logistical difficulties and health problems (Anonymous, 1903a). On 14 June 1903, the Ministry of the Navy addressed the Government of Angola, requesting all needed assistance to be provided to Newton, in order to fulfill his mission (Anonymous, 1903b). A few days later on 25 June 1903, still in Novo Redondo, the naturalist wrote to Aarão de Lacerda and provided an initial report of the difficulties he had experienced during the first three months in the colony,

¹ M’Buta continues to be used in several Angolan local dialects to refer to viperids, but mostly to the Puffadder, *Bitis arietans* Merrem, 1820 (Ceriaco & Marques 2021).

criticizing the lack of logistical and institutional support from the Colonial authorities, which in his opinion had greatly hindered his activities (Newton, 1903c). Newton's report is a powerful example of the difficulties he was experiencing in the field:

"I'm obliged to let your Excellency know that until the present date, seven crates containing the modest results of my work were delivered to the Chief of Novo Redondo Council. I could have done more had I had the indispensable help for this kind of work. Since I arrived in the Province of Angola I still haven't received the slightest help from the authorities. I came to Novo Redondo with a travel document that only stated the following: the naturalist Newton is travelling with the service objective — and nothing more. Only now, after almost three months here has someone remembered about me, providing me with what was supposed. Your Excellency can't imagine what I've endured to carry on to a good port (in the beginning really sad) my mission. Without money, no elements of any kind, having on many occasions to sacrifice my personal belongings, and above all without governmental support. Imagine yourself, your Excellency, with 65\$000 per month, on a country of fever, of beasts... without a guide, without even a servant. Yes, I am on a situation like that. I am selling my life for a very cheap price. And, besides this, what should Francisco Newton do without money? Sit? Wait for better days for his own happiness? But no! Francisco Newton, with fevers and without conditions, has done something." (Newton, 1903c).

Despite the hardships, the collections resulting of that initial month of work filled seven boxes of zoological specimens that were sent to Portugal on 6 July 1903 and 25 July 1903 (Anonymous 1903c, 1903d, 1903e).

At an unknown date, most likely by the end of May or the beginning of June, Newton departed from Novo Redondo and headed north towards the N'Dalla Tando region, currently in Kwanza Norte Province. *En route* he collected birds from Quitenha (undetermined location; see Table 1) and amphibians from Cabiri (Bengo Province) in June and July of 1903, respectively. In August 1903, the naturalist collected specimens of mammals (Seabra, 1905a), amphibians and reptiles (Ferreira, J.B. 1904) and mollusks (Nobre, 1905b) in different localities in Kwanza Norte Province, namely Ambaca (Pomba), Lucalla, N'Dalla Tando, Palmyra, Serra de Stombe (undetermined location) and Zembe (see Table 1; see Fig. 2a) (Anonymous [undated c]). During these excursions Newton used Palmyra, a plantation (*fazenda*) of the Cazengo Agricultural Company (CAC) (Mata et al., 2017) as his main base (Newton, 1903d). Founded in 1900, following the 1890s boom in coffee prices, the CAC was one of the few examples of Portuguese funded entrepreneurship in the colony, as the majority of investments in the Portuguese Empire were funded by foreign companies (Mata et al., 2017). This combined with the recent construction of the railway (Luanda–Ambaca), promoted the growth of the agricultural industry in the region, as well as other localities in the Cazengo district. The railroad perfectly fit the needs of the coffee producers, with the stations

of N'Dalla Tando and Lucala receiving most of the shipments (Van Dongen, 1961), and it is very likely that Newton took advantage of these infrastructures during his field work there. On the other hand, the small town of Ambaca had been, since late seventeenth century, a mandatory crossing point for slave trade from the interior of the province to Luanda, as well as for goods headed from the coast towards the inlands (Vansina, 2005). By the time Newton collected in the region, Ambaca was vital as a trade outpost. From there, the naturalist moved to Luanda where, on 16 September 1903 (Anonymous, 1903f), he delivered ten boxes containing the recently collected specimens intended to be shipped to Portugal.

He returned to *fazenda* Palmyra on 19 September 1903 to prepare the next phase of the expedition (Newton, 1903d). The same month was spent collecting specimens of amphibians, reptiles, mammals, and mollusks in several localities in the provinces of Kwanza Norte, as Catari, Cabcicula, Cazengo, Hôcco, N'Dalla Tando, and Zembe, but also in several localities in Kwanza Sul (Chingo, Novo Redondo, Selles) and Bengo (Cabiri and Catete) provinces, as well as from "Quitenha (Rio Quango)" (undetermined locality) (see Table 1; see Fig. 2a) (Anonymous [undated] c). In Hôcco, another *fazenda* belonging to the Cazengo Agricultural Company (CAC) (Mata et al., 2017), Newton met the Portuguese captain Frederico Trigo Teixeira (see portrait online: <https://actd.iict.pt/view/actd:AHUD8253>), who offered him a chameleon specimen (MHNC-UP/REP 293). The boxes containing these specimens were initially left in Cazengo on 5 October 1903 (Anonymous, 1903g) to be shipped to Luanda, from where they were sent to Portugal on 8 October 1903 (Anonymous, 1903h).

Newton headed back to Luanda in November, collecting specimens along the way through the provinces of Kwanza Norte (N'Dalla Tando, Palmyra and Prototipo [also known as Prototymo (Mata et al., 2017), another CAC *fazenda*]), Bengo (Bom Jesus, Cacullo, Caxicâne, margens do Quanza, Cunha), Luanda (Cacuaco, Luanda) but also in "Dondo Anzêlle", "Icolo e Bengo" and "Lagoa Quitenha" (undetermined localities) (see Table 1; see Fig. 2b) (Newton 1903e,f). Two letters addressed to Aarão de Lacerda place Newton in Luanda on 24 November and 5 December (Newton 1903g, h), from where the six boxes of specimens that resulted from this last part of the trip were sent to Portugal on 24 November and 14 December (Anonymous 1903i,j). Sometime in 1903, Newton also collected in Biné and Margens do rio Quéve, Selles (undetermined localities), although these records are not associated with a month or months of collection (Anonymous [undated] d).

From January to May 1904, the naturalist made his last excursion in the northern part of the country, mainly in the provinces of Kwanza Norte (Bango, Bango Aquitamba, Cacólombôlo, Cambondo, Camilungo, Camuanze, Golungo Alto, Luinha, Rio Cuango, Messo Cassuco, Monte Alegre, Florestas Mupépe, N'Delle, N'Golla Bumba, Quéta, Quilombo, Zanga) and Bengo (Catete, Quissanga) (see Table 1; see Fig. 2c). Newton also collected specimens from Cavernas de Quimvanda, próximo de Golungo Alto, Cafuxi,

Florestas Kakolo, Florestas Kalala, Florestas Margens do Quanza, Katála, Margens do Rio Quiapose, Riacho Cate, Rio Lucué and Rio Zenga (undetermined localities, see Table 1) (Anonymous [undated] b,c; Newton, 1904a). Some of these localities represent areas of importance to the Portuguese colonial enterprise, as for example Monte Alegre and Bango Aquitamba. Monte Alegre (also “Montealegre”) was a *fazenda* that belonged to the CAC. Bango Aquitamba dates back at least from 1689, when the Carmelitas Descalços (Barefoot Carmelites) established a Catholic mission in the locality and built a church (Lima, 1846). The land belonged to the Soba (= traditional leader) of Bango Aquitamba. In 1846, the Soba was known to be one of the most important farmers in Golungo Alto, leading the Luanda Government to try to persuade him to grow crops of cotton, coffee, and tobacco, in order to stimulate agricultural production in the colony (Ferreira, R. 2013). From the aforementioned localities, Newton collected specimens of amphibians, birds, crustaceans, fishes, insects, mammals, mollusks and reptiles, of which some were published and include the description of several new species (Ferreira, J.B. 1906; Nobre, 1905b; Seabra, 1905a, 1905b), resulting in eight boxes of specimens (including mineralogical collections), that were shipped from Luanda on 13 February, 13 April and 24 May (Anonymous, 1904a, b,c).

The last part of Newton's journey to Angola took place in the southwestern Province of Namibe (see Fig. 2d). The early colonization of this region started in the end of the 1830's (Pereira, 2018), when settlers from the Azores, Madeira, Algarve and Póvoa de Varzim (northern Portugal) (Medeiros, 1972) established themselves in the towns of Mossâmedes, Porto Alexandre, São Januário and Sá da Bandeira (Pereira, 2018). By 1890, fishing was the main economic activity in southern Angola, becoming known as its “white-gold” (Clarence-Smith, 1976). When Newton collected in the region, Mossâmedes (now Moçâmedes) was a town (“vila”) undergoing rapid development, being raised to city status in 1907. At the time, the province was subject to major investments from the Portuguese Government, namely the construction of a railroad system to connect Mossâmedes to the highlands of Huíla, allowing the city to grow exponentially (Amaral, 1978; Pereira, 2018), while Porto Alexandre (currently Tômbua) was rising in importance as a port due to its fishing industry (Mendes, 2005).

On June 1904 Newton began his expedition in the southwestern coastal regions of Angola. During the months of June and July, the naturalist explored the coastal town of Porto Alexandre and its vicinity (Bahia de Porto Alexandre and Cabo Negro de Porto Alexandre), as well as the surrounding wetter areas of Camilunga, the Coroca River and its plains and lagoons, Pinda and Unguay [=Nonguai], from where he collected birds (Seabra, 1906c) and reptiles (unpublished) (see Table 1; see Fig. 2d) (Anonymous, [undated] b). In a letter dated 5 July, the naturalist wrote from “Margens do Rio Coroca”, asking for permission to request the materials he needed in order to continue his exploration of the south,

namely in the regions between the Coroca and Cunene rivers (Newton, 1904b). Besides the above-mentioned localities, bird specimens extant in MHNC-UP and collected in July 1904 bear the localities of Lagoa do Tua, Mu-rondo and N. Jumbo, which we were unable geolocate (see Table 1).

In the months of August, September, and October of the same year, Newton surveyed Porto Alexandre and neighboring areas, such as Cabo Negro, Pinda, Coroca river and its lagoons (currently known as Lagoa do Arco) and Chacuto (undetermined), where he continued to collect amphibians, birds, fishes, crustaceans, insects, mammals, mollusks, and reptiles (unpublished) (see Table 1; see Fig. 2d) (Anonymous, [undated] c). In November, the naturalist collected birds in Porto Alexandre and Mossâmedes, and in December traveled to the Cunene River mouth, stopping by Bahia dos Tigres on the way (Newton, 1904c) (see Table 1; see Fig. 2d), and once again collecting birds (published by Seabra, 1907), crustaceans, fishes, insects, and mammals in both regions (Anonymous, [undated] c). This trip must have been made through the coastal desert strip.

In a letter presented to the authorities of Mossâmedes dated 20 February 1905, Newton requested additional supplies to continue his trip (Anonymous, 1905a). Extant ornithological specimens still housed in MHNC-UP from Cabo Negro dated from February 1905 show that he was still actively collecting at the time. Additionally, a shipment of eight boxes with zoological specimens departed from Luanda on 11 February (Anonymous, 1905b). Seabra (1907, 1909) cited birds and mammals from Mossâmedes, Pinda, and Porto Alexandre for the year of 1905, although with no indication of month. All the amphibians, reptiles, invertebrates, and fishes still extant in MHNC-UP from Bahia dos Tigres and Mossâmedes remain unpublished. According to specimen lists from the expedition, Newton also collected in Lucira and Carumjamba (Namibe Province), although no specimens from these localities were located in MHNC-UP's collections (Anonymous, [undated] c). Furthermore, Seabra (1905c, 1906b,c, 1907) published ornithological specimens from this part of the trip, matching the aforementioned localities, but the majority lacked collecting date, making it difficult to assign them to the corresponding months.

Later that year, five boxes and a case of zoological specimens were shipped from Luanda on 1 September and three additional cases on 10 November from Benguela (Anonymous, 1905c, 1905d). Those are the last recorded shipments from the expedition. From that point onwards, Newton's whereabouts are unknown until the moment he left the country in 1906. We found no extant specimens dated from February 1905 to April 1906. According to documentation from the Government of Angola, the naturalist returned to Portugal on 12 April 1906, departing from Luanda to Lisbon (Anonymous, 1906b). Newton was said to be ill by the Health Department of the Military Hospital, suffering from malaria (“Anemia palustre”) (Anonymous, 1906a), and thus justifying the inevitability of his return to the metropole.

Back in Portugal, a request was issued to the Ministry of the Navy on 9 May (Oliveira, 1906), asking for a three-month long subsidy (about half of his monthly salary) on behalf of Francisco Newton, as the explorer was still suffering from malaria. Two extensions were requested, on 26 July (Newton, 1906; Ferreira, J.J. 1906) and 2 November (Leão, 1906), as he still needed more time to recover from his acute malaria (“anemia palustre profunda”). The following year, on 10 April 1907, Newton was nominated to conduct a zoological survey of Guinea Bissau, where he would be collecting for Academia Politécnica do Porto (Anonymous, 1907a). There are no extant specimens in MHNC-UP from that expedition or any records attesting to his nomination. As stated before, Newton was fired from this mission in 1908. His death came in December of the following year.

MAIN RESULTS OF THE EXPEDITION

Several authors were responsible for the identification of the specimens Newton collected in Angola. Ferreira published two papers regarding the amphibians and reptiles (Ferreira, J.B. 1904, 1906); Augusto Nobre authored the only publication on the expedition’s mollusks (Nobre, 1905b) and the Portuguese mammologist Antero Frederico de Seabra (1874–1952) penned eight papers on both birds and mammals (Seabra 1905a,b,c, 1906a,b,c, 1907, 1909). According to recently discovered documentation, Newton collected over 600 insect specimens, some of which were sent to Ignacio Bolívar for identification, although the Spanish entomologist never published any results from the expedition (Anonymous [undated] d; Nobre 1905a). Of the specimens collected by Newton in Angola, approximately 150 amphibian specimens, 170 birds, 170 reptiles, 20 mammals and an undetermined number of fishes, mollusks, insects and other invertebrates are still extant in MHNC-UP. Several boxes and jars of both insects and mollusk specimens have been located in MHNC-UP and are currently being inventoried.

In total, the expedition resulted in the description of 27 new zoological taxa, including one recent description. The newly described taxa resulting from Newton’s Angola expedition are presented in Table 2. The herpetological specimens have recently been addressed by Ceriaco et al. (2014) and Santos et al. (in press). Ceriaco et al. (2014) presented an updated catalogue of the amphibian and reptile type specimens extant today in MHNC-UP and located 12 of the 18 type specimens published by Ferreira, J.B. (1904, 1906). In a recent review of the species of the genus *Boaedon* from Angola, Hallerman et al. (2020) used three specimens collected by Newton (MHNC-UP/REP 166–168) as paratypes in the description of *Boaedon bocagei* Hallermann, Ceriaco, Schmitz, Ernst, Conradie, Verburgt, Marques and Bauer 2020. An additional species of frog, genus *Phrynomantis* (Microhylidae), is currently being described using specimens collected by Newton during this expedition (Ceriaco et al. in press).

Further research is being conducted to locate the mollusk type specimens, as well as unpublished specimens present in

collection lists. Nobre’s (1905b) paper on the mollusks seems to not have received further attention after its publication and upon research in online databases, only one of the new species was located. Little is known about Angolan freshwater and land mollusks (Graf & Cummings, 2006) and as such we cannot attest to the validity of the new taxa Nobre described (Table 2).

THE DEATH OF NEWTON AND THE NEGLECT OF HIS HERITAGE

Despite the impressive numbers of new taxa resulting from his expeditions to, at that point, some of the most unexplored regions in the world, Newton’s fate was grim. Three years after his last Angolan expedition, and after an unsuccessful mission to Guinea-Bissau and Cabo Verde, Newton passed away on 9 December 1909, amidst a very unstable personal situation. Without property, living at his cousins’ house in the city of Matosinhos (northern outskirts of Porto) and facing what we assume to have been an alcoholism-related liver disease (Silva (1940) labeled Newton as a “bohemian”, that would “drink beer in the mornings”), Newton passed away poor and without descendants. According to the local newspaper *O Commercio do Porto*, Newton’s funeral was held on the following day, and was attended by a large crowd, mostly comprising his friends and family, including Augusto Nobre, who became the depositary of Newton’s coffins keys (Anonymous, 1909). The funeral ceremonies took place at the Church of Matosinhos (today known as Igreja Paroquial do Senhor Bom Jesus de Matosinhos), and the naturalist was buried in the mausoleum of Manuel Sampaio’s family, likely friends of Newton’s family, in the adjacent cemetery (Livro de Enterramentos nº1 of the Matosinhos Municipality Historical Archive). However, the Matosinhos cemetery would not turn out to be the final resting grounds for Newton. According to the Matosinhos Municipality Historical Archive, on 4 June 1951 Newton’s bones (together with those of his parents) were gathered (Livro de Enterramentos nº1 of the Matosinhos Municipality Historical) and reburied on 8 June of the same year in the mausoleum nº 240 of the Carmo Order in the Cemetery of Agramonte, Porto (City of Porto Townhall Archive). This mausoleum had been bought in the late 1880’s by the Cabral family, an influential Portuguese family, one of the members of which married one of Francisco Newton’s sisters (Carmo Order Archive). A visit to the cemetery to locate Newton’s remains proved, however, unsuccessful. We visited the Agramonte Cemetery on 10 December 2020 (incidentally, exactly 111 years after Francisco Newton’s original burial) and were able to locate mausoleum nº240 of the Carmo Order. It was immediately understood that the mausoleum had been taken by a new family, as indicated by the identification lettering on the mausoleum door, as well as to the visible presence of modern coffins within it. After a query in the Cemetery offices and subsequently in the Carmo Order, we were informed that as the mausoleum had been abandoned for several decades, it was sold in 2010 to a new family, and the bodies and bones it contained were reburied in unmarked common graves in the Agramonte

Table 2. New taxa described from Newton's 1903–1906 expedition to Angola.

ORIGINAL NOMEN	PRESENT NOMEN	TYPE MATERIAL	TYPE LOCALITY
Amphibia/Anura/Hyperoliidae			
<i>Rappia bivittata</i> Ferreira, 1906	<i>Hyperolius platyceps</i> (Boulenger, 1900)	Syntypes: MHNC-UP/ANF 207–209	“N’Golla Bumba” “Quilombo” “Rio Luinha”
<i>Rappia bocagei</i> var. <i>maculata</i> Ferreira, 1906	<i>Hyperolius bocagei</i> (Steindachner, 1867)	Not located	“Golungo Alto”
<i>Rappia fasciata</i> Ferreira, 1906	<i>Hyperolius platyceps</i> (Boulenger, 1900)	Holotype: MHNC-UP/ANF 206	“Quilombo”
<i>Rappia nobrei</i> Ferreira, 1904	<i>Hyperolius adspersus</i> Peters, 1877	Syntypes: MHNC-UP/ANF 210–211	“Cabiri”
<i>Rappia osorioi</i> Ferreira, 1906	<i>Afrixalus osorioi</i> (Ferreira, 1906)	Syntypes: MHNC-UP/ANF 212–214	“Quilombo”
<i>Rappia platyceps</i> var. <i>angolensis</i> Ferreira, 1906	<i>Hyperolius platyceps</i> (Boulenger, 1900)	Syntypes: MHNC-UP/ANF 205	“Quilombo” “N’Golla Bumba”
<i>Rappia seabrai</i> Ferreira, 1906	<i>Hyperolius bocagei</i> (Steindachner, 1867)	Syntypes unlocated Paratype: MHNC-UP/ANF 216	“Quilombo” “Rio Luinha” “Duque de Bragança (1865)”
Amphibia/Anura/Arthroleptidae			
<i>Hylambates bocagei</i> var. <i>leucopunctata</i> Ferreira, 1904	<i>Leptopelis bocagii</i> (Günther, 1865)	Syntypes: MHNC-UP/ANF 184–185	“Gumba”
<i>Arthroleptis carquejai</i> Ferreira, 1906	<i>Arthroleptis carquejai</i> Ferreira, 1906	Holotype: MHNC-UP/ANF 188	“Cambondo”
Reptilia/Squamata (Serpentes)/Typhlopidae			
<i>Typhlops bocagei</i> Ferreira, 1904	<i>Afrottyphlops lineolatus</i> (Jan, 1864)	Syntypes unlocated	“Cabícula” “Bom Jesus, margens do Quanza”
Reptilia/Squamata (Serpentes)/Lamprophiidae			
<i>Boaedon bocagei</i> Hallermann, Ceriaco, Schmitz, Ernst, Conradie, Verburt, Marques and Bauer 2020	<i>Boaedon bocagei</i> Hallermann, Ceriaco, Schmitz, Ernst, Conradie, Verburt, Marques and Bauer 2020	Paratypes: MHNC-UP/REP 166–168	“Novo Redondo”
Mollusca/Streptaxidae			
<i>Streptaxis bethencourtii</i> Nobre, 1905	<i>Gonaxis bethencourtii</i> (Nobre, 1905)	Not located	“Fôrets de Mupépe, sous les feuilles sèches”
<i>Ennea carquejai</i> Nobre, 1905	–	Not located	“Rives du fleuve Luce, lieux humides des fôrets”
<i>Ennea angolensis</i> Nobre, 1905	–	Not located	“Fôrets de Mupépe, sous les feuilles sèches”
Mollusca/Urocyclidae			
<i>Trochozonites furtadoi</i> Nobre, 1905	–	Not located	“Gumba”
<i>Trochozonites newtoni</i> Nobre, 1905	–	Not located	“Fôrets de Mupépe, sous les feuilles sèches”
Mollusca/Helicidae			
<i>Helix lacerdai</i> Nobre, 1905	–	Not located	“Katála” “Gumba, Serre de Selles; sur les feuilles des graminées”
<i>Helix isaaci</i> Nobre, 1905	–	Not located	“N’Dalla Gando, Cazengo, dans l’écorce des arbres”

Table 2. Continued...

ORIGINAL NOMEN	PRESENT NOMEN	TYPE MATERIAL	TYPE LOCALITY
Mollusca/Camaenidae			
<i>Amphidromus tavaresi</i> Nobre, 1905	–	Not located	“Sur les sépultures des négres, près de Novo Redondo”
Mollusca/Achatinidae			
<i>Opeas bocagei</i> Nobre, 1905	–	Not located	“Fôrets de Mupépe, sous les feuilles sèches”
<i>Opeas vieirai</i> Nobre, 1905	–	Not located	“Gumba”
<i>Opeas welwitschi</i> Nobre, 1905	–	Not located	“Forêts de Mupépe” “Luinha”
<i>Subulina seabrai</i> Nobre, 1905	–	Not located	“Fôrets de Mupépe, sous les feuilles sèches”
<i>Homorus sampaioi</i> Nobre, 1905	–	Not located	“Fôrets de Mupépe, sous les feuilles sèches” “Rives du fleuve Luce, lieux humides des fôrets”
<i>Homorus paulinoi</i> Nobre, 1905	–	Not located	“Gumba”
Mollusca/Physidae			
<i>Physa moreleti</i> Nobre, 1905	–	Not located	“Ruisseaux de Luinha”
<i>Physa osorioi</i> Nobre, 1905	–	Not located	“Gumba”

Cemetery. As no records were kept of where the bodies were reburied, there is no way to locate Newton’s remains. This outcome, despite being frustrating and somehow sad, is at the same time relatable to Newton’s life — a poorly supported adventurer and traveler, who even in death, continued to wander from place to place.

This neglect and lack of support have also affected Newton’s collections and scientific heritage. Most of Newton’s collections, amassed during his missions to the Gulf of Guinea, Timor, Guinea-Bissau, and Cabo Verde, with the exception of a few fluid preserved fishes that were on loan outside the museum, were permanently lost in the fire that destroyed Museu Bocage in 1978. Even today, these surviving specimens are still not yet fully catalogued. The collections of Newton’s 1903–1906 Angolan expedition have been deposited in what is now the MHNC-UP for more than a century, but they have been mostly neglected since then. Aside from the handful of papers published in the early 1900’s by Ferreira, J.B. (1904, 1906), Seabra (1905,a,b,c, 1906a,b,c, 1907, 1909) and Nobre (1905b), the collections have not been properly reviewed by specialists and have simply remained in their jars and shelves, escaping fluid evaporation and the attack of insect infestations. Besides Perret (1976a, b) who borrowed some type specimens of amphibians and Ceríaco et al. (2014) who provided an illustrated type catalogue of the herpetological collection, these specimens have been mostly omitted from the literature. There are several potential explanations for this situation, such as the poor distribution of the Portuguese journals, the language (Portuguese) in which they were written, and by the lack of visibility of the

Natural History Museum of Porto in international vertebrate zoology circles. All this is tied to the neglect that Portuguese Natural History collections have experienced for decades, a situation not so different to that of many other natural history institutions around the world (Andreone et al., 2014; Andreone, 2015; Kemp, 2015), but especially exacerbated in Portugal, due to the lack of investment and the usual shortage of funds (Ceríaco 2021). Alongside a much-needed renovation of the museum, Newton’s collections are being catalogued and reviewed, with several works currently in preparation and already being finalized for submission to publishers (e.g., Santos et al. in review). In addition, a biography of Francisco Newton is currently being prepared by the authors (Ceríaco and Santos in prep.), to restore the memory of one of the most important, yet largely forgotten, Portuguese naturalist-explorers of the nineteenth and early twentieth centuries.

ACKNOWLEDGMENTS

The authors want to thank the Arquivo Histórico Ultramarino (AHU), Arquivo Histórico de Angola (AHA), Porto and Matosinhos Municipalities Archives, as well as Carmo Order Archives, the Cemetery Archives of Agramonte and the Cemetery Offices of Matosinhos Municipality for details on Newton’s last resting place. We would also like to thank Mariana Marques for the help, patience, and enthusiasm she shared with us regarding this project and Rita Gomes for the collaboration in the initial parts of this investigation. Aaron M. Bauer and Werner Conradie for comments on early versions of

the manuscript. Lastly, we want to thank Luzia Sousa, former curator of MHNC-UP for introducing one of the authors to the life and works of Francisco Newton and providing initial access to its collections and documentation in MHNC-UP.

REFERENCES

- Amaral, I. 1978. Contribuição para o conhecimento do fenómeno de urbanização em Angola. *Finisterra. Revista Portuguesa de Geografia* 13(25):43–85.
- Andreone, F. 2015. Natural history: save Italy's museums. *Nature* 517:271.
- Andreone, F., Bartolozzi, L., Boano, G., Boero, F., Bologna, M., Bom, M., Bressi, N., Capula, M., Casale, A., Casiraghi, M., Chiozzi, G., Delfino, M., Doria, G., Durante, A., Ferrari, M., Gippoliti, S., Lanziger, M., Latella, L., Maio, N., Marangoni, C., Mazzoti, S., Minelli, A., Muscio, G., Nicolosi, P., Pievani, T., Razzeti, E., Sabella, G., Valle, M., Vomero, V., Zilli, A. 2014. Italian natural history museums on the verge of collapse? *ZooKeys* 456:139–146.
- Anonymous. [undated a]. Unpublished manuscript [Important dates from the Newton expedition]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. [undated b]. Unpublished manuscript [Specimen list from the Newton expedition] Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 13 pp.
- Anonymous. [undated c]. Unpublished manuscript [Specimen list from the Newton expedition] Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 2 pp.
- Anonymous. [undated d]. Unpublished manuscript [Insect specimen list from the Newton expedition]. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 18 pp.
- Anonymous. 1878. Unpublished manuscript, 24 April 1878. [Declaration of Isaac Newton's nationality]. A-PUB/2332 - f. 123–123v; Arquivo Municipal do Porto. 2 p (accessed 8 June 2020).
- Anonymous. 1892a. Unpublished manuscript, 31 December 1892. [Report on Newton's performance on the S.Tomé and Príncipe survey]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 2 pp.
- Anonymous. 1892b. Unpublished manuscript. [Relatório do Ateneu Comercial do Porto, 1892]. Porto, Portugal.
- Anonymous. 1895. Unpublished manuscript, 15 October 1895. [Newton's nomination for an expedition to Timor]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1897. Unpublished manuscript, 20 April 1897. [Notice of Newton's return to Portugal from Timor]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1902. Unpublished manuscript, 29 October 1902. [Newton's nomination for an expedition to Angola]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1903a. Unpublished manuscript, 3 July 1903. [Health deputy reports Newton as being ill]. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 1 pp.
- Anonymous. 1903b. Unpublished manuscript, 14 June 1903. [The Ministry of the Navy informs that all requested assistance must be provided to help Newton on his expedition]. 1732; Arquivo Histórico de Angola. 1 pp.
- Anonymous. 1903c. Unpublished manuscript, 6 July 1903. [Shipment notice of three boxes destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 2 pp.
- Anonymous. 1903d. Unpublished manuscript, 2 June 1903. [Reception notice of four boxes of zoological specimens destined to APP]. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 1 pp.
- Anonymous. 1903e. Unpublished manuscript, 25 July 1903. [Shipment notice of four boxes of zoological specimens destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1903f. Unpublished manuscript, 16 September 1903. [Reception notice of ten boxes of zoological specimens]. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 1 pp.
- Anonymous. 1903g. Unpublished manuscript, 5 October 1903. [Reception notice of two boxes of zoological specimens]. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 1 pp.
- Anonymous. 1903h. Unpublished manuscript, 8 October 1903. [Shipment notice of two boxes of zoological specimens destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1903i. Unpublished manuscript, 24 November 1903. [Shipment notice of four boxes of zoological specimens destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1903j. Unpublished manuscript, 14 December 1903. [Shipment notice of two boxes of zoological specimens destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1904a. Unpublished manuscript, 13 February 1904. [Shipment notice of one box of zoological specimens destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1904b. Unpublished manuscript, 13 April 1904. [Shipment notice of one box of zoological specimens destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1904c. Unpublished manuscript, 24 May 1904. [Shipment notice of six boxes of zoological specimens destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1905a. Unpublished manuscript, 20 February 1905. [Notice of Newton's request of additional resources for the expedition]. 1732; Arquivo Histórico de Angola. 1 pp.
- Anonymous. 1905b. Unpublished manuscript, 11 February 1905. [Shipment notice of eight boxes of zoological specimens, three of which destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1905c. Unpublished manuscript, 1 September 1905. [Shipment notice of five boxes and a case of zoological specimens, three of which destined to APP]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1905d. Unpublished manuscript, 10 November 1905. [Shipment notice of three cases of zoological specimens destined to APP]. 1732; Arquivo Histórico de Angola. 1 pp.
- Anonymous. 1906a. Unpublished manuscript, 12 April 1906. [Report about Francisco Newton in Angola]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 2 pp.
- Anonymous. 1906b. Unpublished manuscript, 12 April 1906. [Shipment notice of Newton's departure from Angola to Portugal]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1907a. Unpublished manuscript, 10 April 1907. [Newton's nomination for an expedition to Guinea Bissau]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1907b. Unpublished manuscript, 6 June 1907. [Request for Newton to move the expedition to Cabo Verde]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 2 pp.

- Anonymous. 1908a. Unpublished manuscript, 25 January 1908. [Complaint regarding Newton's activities in the province of Cabo Verde]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 2 pp.
- Anonymous. 1908b. Unpublished manuscript, 29 January 1908. [Complaint regarding Newton's activities in the province of Cabo Verde]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 3 pp.
- Anonymous. 1908c. Unpublished manuscript, 12 February 1908. [The Crown fires Newton from the expedition]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Anonymous. 1909. Untitled news article [Newton's death news]. *O Commercio do Porto*, 11 dezembro 1909.
- Bocage, J.V.B. 1886a. Reptis e Amphibios de S. Thomé. *Jornal de Sciencias Mathematicas, Physicas e Naturaes*, 11(42):65–70.
- Bocage, J.V.B. 1886b. Reptiles et Batraciens nouveaux de l'Île de St. Thomé. *Jornal de Sciencias Mathematicas, Physicas e Naturaes*, 11(42):71–75.
- Bocage, J.V.B. 1887. Mélanges Erpétologiques. II Reptiles de Dahomey. *Jornal de Sciencias Mathematicas, Physicas e Naturaes*, 11(44):192–197.
- Bocage, J.V.B. 1890. Sur une espèce nouvelle à ajouter à la faune Erpétologique de St. Thomé et Rolas. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 2(5):61–62.
- Bocage, J.V.B. 1893. Diagnoses de deux nouveaux reptiles d'île de Anno-Bom. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 3(9):47–48.
- Bocage, J.V.B. 1895a. Sur un batracien nouveau de Fernão do Pó. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 3(12):270–272.
- Bocage, J.V.B. 1895b. Subsídios para a fauna da ilha de Fernão do Pó. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 4(13):1–15.
- Ceríaco, L.M.P. 2021. *Zoologia e Museus de História Natural em Portugal (Séculos XVIII–XX)*. Editora da Universidade de São Paulo, São Paulo. 712 pp.
- Ceríaco, L.M.P. & Marques, M.P. 2021. *Serpentes venenosas de Angola. Guia de identificação e primeiros socorros*. Arte e Ciência, Porto, 216 pp.
- Ceríaco, L.M.P., Blackburn, D.C. Marques, M.P., Calado, F.M. 2014. Catalogue of the amphibian and reptile type specimens of the Museu de História Natural da Universidade do Porto in Portugal, with some comments on problematic taxa. *Alytes* 31:13–36.
- Ceríaco, L.M.P., Santos, B.S., Marques, M.P., Bauer, A.M., Tiutenko, A. In press. Citizen Science meets specimens in old formalin filled jars: a new species of Banded Rubber Frog, genus *Phrynomantis* (Anura: Microhylidae) from Angola. *Alytes*.
- Clarence-Smith, W.G. 1976. Slavery in coastal southern Angola, 1875–1913. *Journal of Southern African Studies* 2(2):214–223.
- Diogo, M.P. & Navarro, B.J. 2018. Re-Designing Africa: Railways and Globalization in the Era of the New Imperialism. Pp. 105–128 In Pretel, D. & Camprubí, L. (ed.), *Technology and Globalisation*. Palgrave Macmillan, Cham, London.
- Ferreira, J.B. 1904. Reptis e Amphibios de Angola da Região ao Norte do Quanza (Collecção Newton – 1903). *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 7(26):111–117.
- Ferreira, J.B. 1906. Algumas espécies novas ou pouco conhecidas de Amphibios e Reptis de Angola (Colecção Newton – 1903–1904). *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 7(27):159–171.
- Ferreira, J.B. 1897a. Sobre alguns reptis ultimamente enviados á secção Zoológica do Museu de Lisboa. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 4(16):111–116.
- Ferreira, J.B. 1897b. Sobre um “*Hemidactylus*” novo da ilha de Anno Bom. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 4(16):249–251.
- Ferreira, J.B. 1898. Reptis de Timôr no Museu de Lisboa. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 5(18):151–156.
- Ferreira, J.J. 1906. Unpublished manuscript, 26 July 1906. [Request for an extension of the three-month subsidy on behalf of Francisco Newton]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Ferreira, R. 2013. Agricultural enterprise and unfree labour in nineteenth-century Angola. Pp. 225–242 In: Law, R., Schwarz, S. & Strickrodt, S. (ed.), *Commercial Agriculture, the Slave Trade and Slavery in Atlantic Africa*. Boydell & Brewer, Suffolk.
- Ferreira, V. 1909. Unpublished manuscript, 3 September 1909. [Notice of Newton's request to return overseas]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 2 pp.
- Figueiredo, E., Smith, G.F. & Ceríaco, L.M.P. 2019. The vascular plant collections of Francisco Newton (1864–1909) in Angola. *Phytotaxa* 413(3):207–224.
- Graf, D.L. & Cummings, K.S. 2006. Freshwater mussels (Mollusca: Bivalvia: Unionoida) of Angola, with description of a new species, *Mutela wistarmorrisi*. *Proceedings of the Academy of Natural Sciences of Philadelphia* 155:163–194.
- Hallerman, J., Ceríaco, L.M.P., Schmitz, A., Ernst, R., Conradie, W., Verburgt, L., Marques, M.P. & Bauer, A.M. 2020. A review of the Angolan House snakes, genus *Boaedon* Duméril, Bibron and Duméril (1854) (Serpentes: Lamprophiidae), with description of three new species in the *Boaedon fuliginosus* (Boie, 1827) species complex. *African Journal of Herpetology* 69(1):29–78.
- Henriques, J. 1885. Contribuição para o estudo da flora d'algumas possessões portuguesas. Plantas colhidas por F. Newton na Africa occidental. *Boletim da Sociedade Broteriana* 3:129–140.
- Kemp, C. 2015. Museums: The endangered dead. *Nature* 518:292–294.
- Leão, J.F.S. 1906. Unpublished manuscript, 2 November 1906. [Request for an extension of the three-month subsidy on behalf of Francisco Newton]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Lima, J.J.L. 1846. Capítulo VII – Religião e Regimen Ecclesiastico. Pp. 147–160 In: Lima, J.J.L. (ed.) *Ensaio sobre a statistica das possessões Portuguezas na Africa Occidental e Oriental; na Asia Occidental; na China e na Oceania. Escripções de Ordem do Governo de sua Majestade fidelissima a senhora D. Maria II. Livro III. Ensaio sobre a statistica de Angola e Benguella e suas dependências na Costa Occidental d'Africa ao Sul do Equador. Parte I. Statistica Geral*. Imprensa Nacional, Lisboa.
- Machado, A. 1946. Dr. Augusto Pereira Nobre. *Annaes Scientificos da Academia Polytechnica do Porto* 31:208–219.
- Marques, M.P., Ceríaco, L.M.P., Blackburn, D.C. & Bauer, A.M. 2018. Diversity and distribution of the amphibians and terrestrial reptiles of Angola – Atlas of historical and bibliographic records (1840–2017). *Proceedings of the California Academy of Sciences Series* 4 65(supplement 2):1–501.
- Mata, M.E., Ferreira, L.F. & Santos, J.P. 2017. Success and failure in Portuguese Colonial Africa: The case of the Cazengo agricultural company (1900–1945). *Entreprises et histoire* 3(88):53–73.
- Medeiros, I.M. 1972. Apontamentos sobre a pesca e a evolução da indústria piscatória em Angola. *Finisterra. Revista Portuguesa de Geografia* 7(13):29–45.
- Mendes, A.M. 2005. Pescas em Portugal: Ultramar – um apontamento histórico. *Revista Portuguesa de Ciências Veterinárias* 100(553–554):17–32.

- Newton, F. 1885. Letter to the Crown, 27 July 1885. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Newton, F. 1897. Letter to the Crown, 21 August 1897. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Newton, F. 1898. Letter to the Crown, 8 August 1898. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Newton, F. 1902a. Letter to Baltasar Osório, 13 January 1902. CN/N-145; Arquivo Histórico do Museu Bocage/Museu Nacional de História Natural e da Ciência. 3 pp.
- Newton, F. 1902b. Letter to Baltasar Osório, 22 January 1902. CN/N-146; Arquivo Histórico do Museu Bocage/Museu Nacional de História Natural e da Ciência. 5 pp.
- Newton, F. 1903a. Letter, 14 May 1903. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 3 pp.
- Newton, F. 1903b. Letter to Ignacio Bolívar, 12 May 1903. ACN0370/031; Archivo del Museo Nacional de Ciencias Naturales. 3 pp.
- Newton, F. 1903c. Letter to Aarão de Lacerda, 25 June 1903. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 3 pp.
- Newton, F. 1903d. Letter to Aarão de Lacerda, 19 September 1903. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 1 pp.
- Newton, F. 1903e. Unpublished manuscript. [Specimen list sent by Newton regarding shipped boxes (collections from November 1903)]. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 2 pp.
- Newton, F. 1903f. Unpublished manuscript. [Specimen list sent by Newton regarding shipped boxes (collections from November 1903)]. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 1 pp.
- Newton, F. 1903g. Letter to Aarão de Lacerda, 24 November 1903. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 1 pp.
- Newton, F. 1903h. Letter to Aarão de Lacerda, 5 December 1903. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 1 pp.
- Newton, F. 1904a. Unpublished manuscript, March 1904. Arquivo Histórico do Museu de História Natural e da Ciência da Universidade do Porto. 3 pp.
- Newton, F. 1904b. Letter to the Secretary General of Angola, 5 July 1904. 1732; Arquivo Histórico de Angola. 1 pp.
- Newton, F. 1904c. Unpublished manuscript, 20 December 1904. [List of materials Newton requested to continue his expedition]. 1732; Arquivo Histórico Angola. 2 pp.
- Newton, F. 1906. Letter to the Crown, 26 July 1906. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Newton, F. 1909. Letter to the Crown, 6 August 1909. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Nobre, A. 1905a. Letter to Ignacio Bolívar, 28 February 1905.
- Nobre, A. 1905b. Molluscos terrestres e fluviaes da exploração de Francisco Newton em Angola. *Annaes de Sciencias Naturaes* IX:103–118.
- Nobre, A. 1935. *Fauna Marinha de Portugal. I. Vertebrados (Mamíferos, Reptis e Peixes)*. Companhia Editora do Minho, Barcelos. 580 p., 77 plates.
- Nobre, A. 1945. *Leça da Palmeira. Recordações e estudos de há sessenta anos*. Gráfica Augusto Costa, Porto. 292 p., 7 plates.
- Oliveira, A.A. 1906. Unpublished manuscript, 9 May 1906. [Request for a three-month subsidy on behalf of Francisco Newton]. AHU-SEMU-DGU-cx.229; Arquivo Histórico Ultramarino. 1 pp.
- Pereira, H.S. 2017. *O papel do Estado no caminho-de-ferro de Ambaca (Angola): da concessão a privados à nacionalização*. VII Congresso de Historia Ferroviaria, Valencia. 11 p.
- Pereira, H.S. 2018. O caminho de ferro de Moçâmedes: entre projeto militar, instrumento tecnodiplomático e ferramenta de apropriação colonial (1881–1914). *Revista de História da Sociedade e da Cultura* 18:157–183.
- Perret, J.-L. (1976a) Revision des amphibiens africains et principalement des types conservés au musée Bocage de Lisbonne. *Arquivos do Museu Bocage* 6:15–34.
- Perret, J.-L. (1976b) Identité de quelques Afrixalus (Amphibia, Salientia, Hyperoliidae). *Bulletin de la Société Neuchâteloise des Sciences Naturelles* 99:19–28.
- Sampaio, J. 1946. Subsídios para a História da Botânica em Portugal. I. O colector Isaac Newton e o estudo das Criptogâmicas celulares portuguesas. (Trabalho de investigação bio-bibliográfica). *Broteria, série de Ciências Naturais* 15(1–2):145–189.
- Sampaio, J. 1947. Subsídios para a História da Botânica em Portugal. I. O colector Isaac Newton e o estudo das Criptogâmicas celulares portuguesas. (Trabalho de investigação bio-bibliográfica). *Broteria, série de Ciências Naturais* 16(1–2):20–52.
- Santos, B.S., Marques, M.P., Bauer, A.M., Ceriaco, L.M.P. In review. Herpetological results of Francisco Newton's zoological expedition to Angola (1903–1906). A taxonomic revision and new records of a forgotten collection. *Zootaxa*.
- Seabra, A.F. 1905a. Mamíferos e aves da exploração de F. Newton em Angola. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 7(26):103–110.
- Seabra, A.F. 1905b. Aves de Angola da exploração de F. Newton. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 7(26):118–128.
- Seabra, A.F. 1905c. Aves da exploração de Fr. Newton em Angola. Subsídios para o conhecimento da distribuição geográfica das aves d'Africa Occidental. *Annaes de Sciencias Naturaes* 9:153–159.
- Seabra, A.F. 1906a. A propósito de algumas espécies de Microchiropteros d'Angola. *Annaes de Sciencias Naturaes*, 10:81–82.
- Seabra, A.F. 1906b. Ribeirinhas e Palmípedes das margens do Rio Cunene. *Annaes de Sciencias Naturaes*, 10:83–90.
- Seabra, A.F. 1906c. Aves de Porto Alexandre. *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 7(27):143–148.
- Seabra, A.F. 1907. Sur quelques Oiseaux d'Angola envoyés par Francisco Newton. Contribution à l'étude de la distribution géographique des Oiseaux de l'Afrique Occidentale. *Bulletin de la Société Portugaise des Sciences Naturelles* 1:41–45.
- Seabra, A.F. 1909. Note sur quelques mammifères de l'Afrique occidentale capturés par Fr. Newton en 1905 et appartenant au muséum d'histoire naturelle de Porto. *Annaes Scientificos da Academia Polytechnica do Porto* IV:218–220.
- Silva, J.D. 1940. *Francisco Newton. Explorador naturalista. (Apontamentos para uma biografia)*. Colecção Pelo Império nº68, Agência Geral das Colónias, Lisboa. 43 p.
- Van Dongen, I.S. 1961. Coffee Trade, Coffee Regions, and Coffee Ports in Angola. *Economic Geography* 37(4):320–346.
- Vansina, J. 2005. Ambaca society and the slave trade c. 1760–1845. *The Journal of African History* 46(1):1–27.

We suggest the following format for citing this article:

Santos, B. S. and L. M. P. Ceriaco 2021. Francisco Newton's Zoological Expedition to Angola (1903–1906): Review of a forgotten expedition. *Bibliotheca Herpetologica* 15(5):31–45.



Avoiding Envenomation While Dancing with Rattlesnakes, the Hopi Snake Ritual and Tobacco

John C. Murphy¹ and Michael D. Cardwell²

¹ Science & Education, Field Museum of Natural History, 1600 Lake Shore Dr., Chicago, IL, USA.
Current address: 2564 E. Murdoch Ct., Green Valley, AZ 85614, USA, serpentresearch@gmail.com

² Biology Department, San Diego State University, 5500 Campanile Drive,
San Diego, CA 92182, USA, mikecardwell31@gmail.com

The ancient art of snake-handling transcends geography and culture and represents attempts to manipulate nature through magic (Morris and Morris 1965). The earliest evidence of indigenous North American people using snakes in ceremonies is a 14th-century bowl from the Jeddito Valley in Navajo County, Arizona (Parsons 1940). The bowl (Fig. 1) links snakes, music, and the Pueblo people. Spanish explorers Hernan Gallegos in 1581 and Antonio de Espejo in 1582 observed indigenous people handling rattlesnakes in what is now northeast Arizona (Parsons 1940). However, rattlesnakes were on the minds of indigenous peoples long before this, as is suggested by petroglyphs with rattlesnake imagery dated 15,000 years before the present (Reiserer 2016). For information on how this was dated see Benson et al. (2013).

The Hopi Nation lives on the longest continuously inhabited site in the western hemisphere. Today, Hopi villages are surrounded by the Navajo Nation, in Navajo and Coconino counties, Arizona. The site covers about 6,500 km² in north-eastern Arizona; and about twelve thousand people are distributed among thirteen villages located on or around three adjacent mesas (Arizona Department of Health 2020). The oldest village, Walpi, is located on First Mesa (Fig. 2).

The mesas are the southernmost extensions of Black Mesa, part of the Colorado Plateau. Each mesa is about 12 kilometers from the next, separated by valleys that drop about 150 m below the summits of the mesas. The Second and Third Mesas are in Navajo County (Weir 2020). Significant cultural differences distinguish the people on each of the mesas (Whiteley 1988) and this includes differences in the way they practice rituals like the late summer rain ceremonies.

The Hopi have also been known as the Tusayan and the Moqui (sometimes spelled Moki) people. However, the people living on these three mesas call themselves the Hopi. Since knowledge of the Hopi snake dance reached the American public and the rest of the world in the late 1870's, the snake dances of the Hopi have been plagued with tourists, artists, and scholars wanting to peer into their lives (Fig. 3). An older Hopi man who learned of anthropologist Peter Whiteley's (1988) studies of the Hopi asked him, "So you studied us, huh? Were we interesting?" The Hopi have been exploited in part because

their culture is interesting, it persists today because the Hopi have resisted conversion to Christianity.

Much of the Hopi culture is based upon the Kachina Cult. Kachinas are visualizations and personifications. Therefore, a kachina can represent anything in the natural world (an ancestor, an element, a location, a quality, a natural phenomenon, or a concept).

Waters (1977:166–167) working with native Hopi White Bear Fredericks described the Kachina Cults this way:

"The *kachinas*, then are the inner forms, the spiritual components of the outer physical forms of life, which may be invoked to manifest their benign powers so that man may be enabled to continue his never-ending journey. They are the invisible forces of life -- not gods, but rather intermediaries, messengers. Hence their chief function is to bring rain, insuring the abundance of crops and the continuation of life....

On page 167 Waters continues:

"As their name denotes (*ka*, respect, and *china*, spirit) they are respected spirits: spirits of the dead; spirits of mineral, plant, bird, animal, and human entities, of clouds, other planets, stars that have not yet appeared in our sky; spirits of all the invisible forces of life."

The basis of the Kachina Cult is the idea of the presence of life in all objects that fill the universe. Everything has an essence or a life force, and humans must interact with these if they are to survive (Wright 2008). Wright (2008) noted that it is easier to interact with impersonal forces if they are given life forms and if patterns of reciprocity and mutual obligations are established. Some archaeological evidence suggests the Kachina Cult may have originated in Meso-America.

Udall (1992) observed that the appeal of the snake dance to Euro-Americans extended well beyond academic interests and entered the American imagination through the fine arts and popular literature. She suggested the discovery of the snake dance coincided with America searching for its national identity. Euro-Americans longed for a noble past and they

adopted the country's ancient roots that visibly survived in indigenous American ceremonials like the Hopi snake dance.

Hopi religious rituals are performed on a well-regulated calendar. They start in August and, in even years, the Snake-Antelope ceremonies are performed by the Snake and the Antelope societies. In odd years, the Flute ceremony is executed by the Blue Flute and Gray Flute societies. Both events are magical efforts to bring rain as the corn crop is maturing. In Arizona, July through September is considered a fifth season—the monsoon (Adams and Comrie 1997).

The Hopi rain ceremony lasts nine or sixteen days depending on who is telling the story; and has multiple components that vary from mesa to mesa. The last day includes a diurnal snake washing ritual and a sunset dance-procession that includes snake handling. The snake dance is the most photographed, drawn, painted, and written about indigenous ritual in North America (Whitley 1988; Udall 1992; Waters 1977).

This paper discusses how knowledge of the Hopi snake dance reached the Euro-American public in the late 19th century and why it attracted the attention of scientists. Additionally, we provide a hypothesis on how the Hopi snake dancers may have reduced the risk of envenomation from rattlesnakes handled during the ceremony.

THE DISCOVERY OF THE SNAKE DANCE BY EURO-AMERICANS

Explorer and soldier, Major John W. Powell visited the Hopi people for two months and wrote about it in *Scribner's Monthly* (Powell 1875). Powell observed some ceremonies but did not write about seeing the snake dance, nor does he report people handling rattlesnakes. Powell's expedition included anthropologist and artifact collector Frank Cushing, from the Smithsonian Institution. Traveling with Powell, Cushing visited the Hopi, and he may have gained some knowledge of the snake dance, but this is not at all clear from his writings.

The earliest report in the American press of the Hopi (Moqui) using snakes is questionable. The eminent 20th century rattlesnake authority Laurence Klauber (1932) suggested the *Presbyterian Messenger* of 1881 published the initial article on the ceremony and he stated the story was simultaneously reprinted in Edinburgh, New York, and London. However, Udall (1992) cited Mateer 1879 as the earliest public media report of the event in a journal titled *Masterkey*. William R. Mateer was the Indian Agent for the Hopi between 1877–1879 (Donaldson 1893).

We attempted to locate the first report of the snake dance by following Udall's 1992 suggestion that it was published in the journal *Masterkey* in 1879. The Southwest Museum in Los Angeles published a journal by that name, but the first issue appeared in 1900. The term *Masterkey* seems to be strongly associated with Freemasons but we failed to find the article Udall refers to (1992).

Instead, we turned to searching newspapers from 1879 using Newspapers.com, and searching with the words “snake

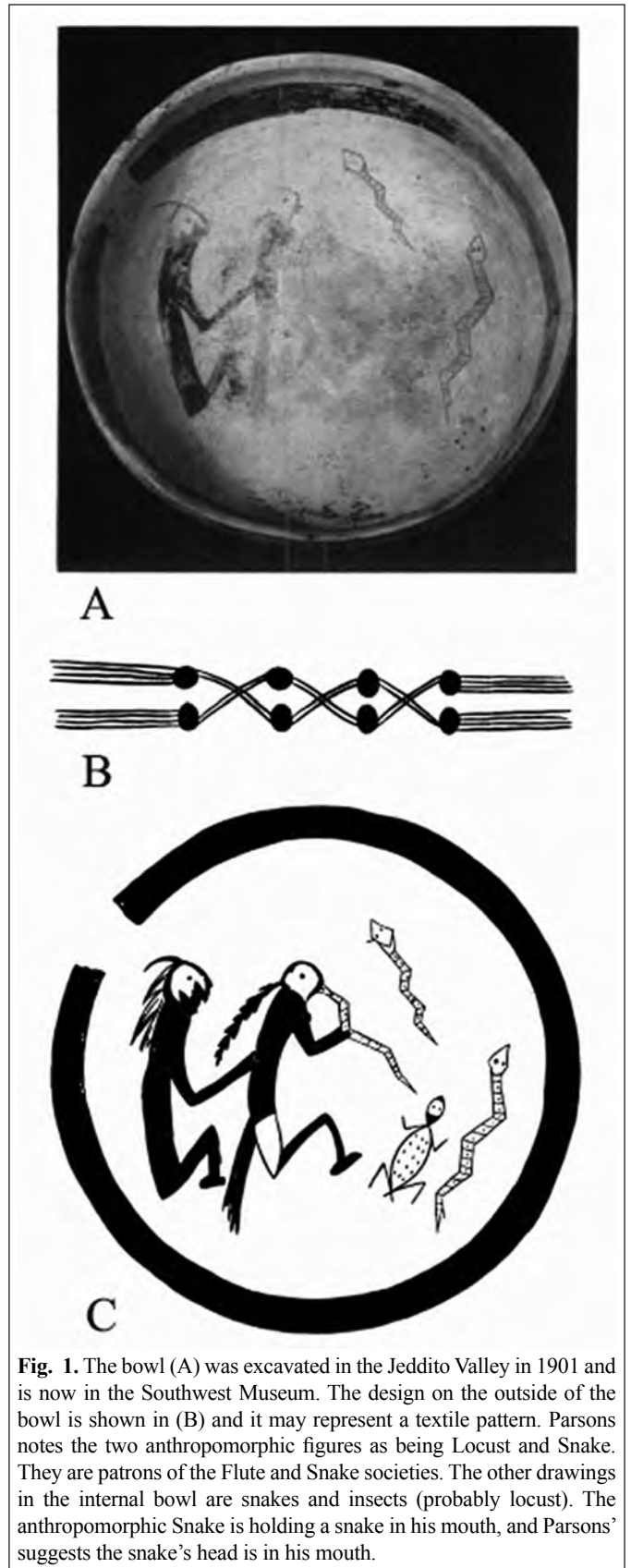


Fig. 1. The bowl (A) was excavated in the Jeddito Valley in 1901 and is now in the Southwest Museum. The design on the outside of the bowl is shown in (B) and it may represent a textile pattern. Parsons notes the two anthropomorphic figures as being Locust and Snake. They are patrons of the Flute and Snake societies. The other drawings in the internal bowl are snakes and insects (probably locust). The anthropomorphic Snake is holding a snake in his mouth, and Parsons' suggests the snake's head is in his mouth.

dance.” The search returned 3,635 articles mentioning snake or dance, or snake dance. We added the name Mateer and



Fig. 2. Walpi, Arizona as photographed by Ansel Adams. US National Archives.

the search returned 57 articles. [Repeating the search for 1878 yielded 2,744 but adding the name Mateer produced no results. Repeating the search again for 1880 it yielded 3,475 articles containing snake or dance, adding the name Mateer reduced the articles to 13, and five of those were on the Hopi ceremony, inferring the story broke in 1879. Organizing the articles by the date of publication the first newspaper to carry the story was the St. Louis Globe Democrat on Thursday September 25 (Fig. 4). The article follows.

W.R. Mateer, Indian Agent of the Moquis Pueblos, of Arizona gave our reporter, a day ago, a thrilling account of a strange ceremony practiced by that tribe, called the "Snake Dance." The Moquis regard the serpent as a sacred reptile, possessed of the power of controlling the elements, and disposed to be friendly

to man. They never kill a snake, and frequently handle the most poisonous serpent with impunity. The rattlesnake is regarded with special veneration, and their bite is no more dreaded than the scratch of a mesquit thorn or the pricking of a cactus. They have an antidote for the bite of a rattlesnake which is infallible, and never fails to effect a cure in a few minutes when administered immediately. An Indian of this tribe, when bitten by a rattler, swallows the antidote at once, and after being stupefied for a moment becomes entirely restored and never feels any pain or inconvenience afterwards. All attempts of white men to learn the ingredients of this antidote have proven futile, as the secret is guarded with religious fidelity, and an Indian would lay down his life rather than communicate the new recipe for snake bites to a pale face. If a white man is bitten by a rattlesnake the Indians will not hesitate to give him the antidote, but he must not inquire what it is composed of.

The Snake Dance

is performed by the Moquis every two years and is resorted to as a means of propitiating the spirit of the Summer Rain to send abundant showers to fructify the earth and make the crops grow. The corn is planted in the moist sand of the mesa, without previous preparation of the ground, for the plow is unknown to the tribe, and after it has grown to a certain height and needs moistening from the clouds, preparations are made for the grand snake dance. A deep and wide excavation is made in the dirt floor of one of the largest houses in the village and the whole tribe go out to hunt snakes. These they catch with their hands, and bring them in twined around their necks, coiled in their bosoms, or wrapped around their legs and arms. All kind of snakes are captured - the rattler, the viper, the moccasin, the blue racer, the black, the

garter, the green, spotted- in fact, every variety existing in the country. These to the number of several hundred are placed in the pit in the floor, and the mouth?? is covered over with a buffalo robe, the hairy side down to prevent the reptiles from crawling out and escaping. Then a certain number of the old men dance around the pit, chanting monotonous songs and calling upon the imprisoned serpents to intercede with the Spirit of the Clouds to send rain upon the thirsting corn-fields. A body of younger men next go through a similar ceremony. Then come the old women, who have a different chant, then the young married women, then the boys, and finally the virgins with their hair done up in loops, and then for a few moments a solemn silence prevails, during which the hissing of the serpents and the shrill sound of their rattles are heard under the buffalo robe. These sounds are taken as favorable tokens that the incantations have been successful, and that a copious fall of rain will follow. Then the buffalo robe is removed, and then the men and boys leap into the pit, and each one brings forth a snake, which he holds in his mouth. As



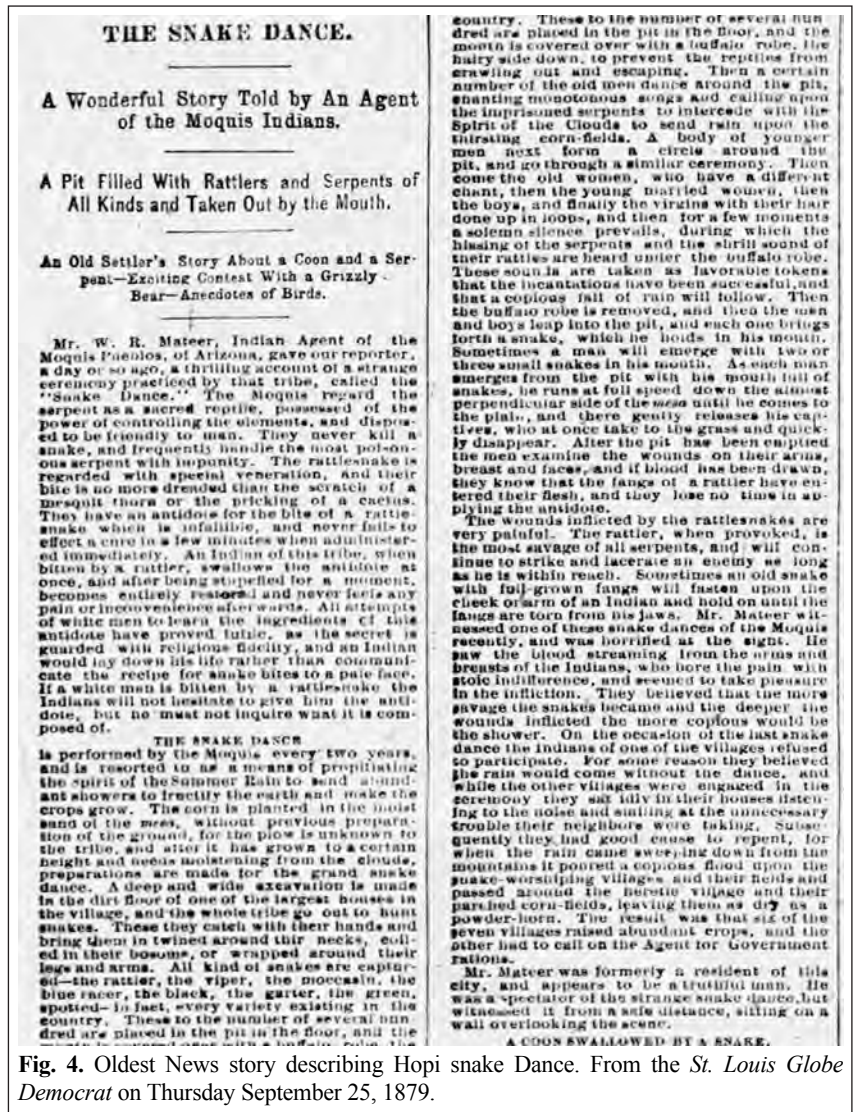
Fig. 3. A crowd gathered to watch the 1887 snake dance at Walpi on 21 August. Hopi priests performing the Antelope-Snake Ceremony near the Dance Rock. Photograph by Ben Wittick.

each man emerges from the pit with his mouth full of snakes, he runs at full speed down the almost perpendicular side of the mesa until he comes to the plain, and there gently releases his captives, who at once take to the grass and quickly disappear. After the pit has been emptied the men examine the wounds on their arms, breasts and faces, and if blood has been drawn, they know that the fangs of a rattler have entered their flesh, and they lose no time in applying the antidote.

The wounds inflicted by the rattlesnakes are very painful. The rattler, when provoked, is the most savage of all serpents, and will continue to strike and lacerate an enemy as long as he is within reach. Sometimes an old snake with full grown fangs will fasten upon the cheek or arm of an Indian and hold on until the fangs are torn from his jaws, Mr. Mateer witnessed one of these snake dances of the Moquis recently, and was horrified at the sight. He saw the blood streaming from the arms and breasts of the Indians, who bore the pain with stoic indifference, and seemed to take pleasure in the infliction. They believe that the more savage the snakes became and the deeper the wounds inflicted the more copious would be the shower. On the occasion of the last snake dance the Indians of one of the villages refused to participate. For some reason they believed the rain would come without the dance, and while the other villages were engaged in the ceremony they sat idly in their houses listening to the noise and smiling at the unnecessary trouble their neighbors were taking. Subsequently they had good cause to repent, for when the rain came sweeping down from the mountains it poured a copious flood upon the snake-worshipping villages and their fields and passed around the heretic village and their parched corn-fields, leaving them as dry as a powder-horn. The result was that six of the seven villages raised abundant crops, and the other had to call on the Agent for Government rations.

Mr. Mateer was formerly a resident of this city and appears to be a truthful man. He was a spectator of this strange snake dance, but witnessed it from a safe distance, sitting on a wall overlooking the scene.

The snake dance drew the attention of scholars and artists as well as the popular press. Public awareness of the event rapidly spread across the country. Mateer clearly stated that the Hopi have an antidote for envenomation, which was of great interest to the scientific community. This was eight years prior to Henry Sewall's (1887) pioneering work with experimentally immunizing pigeons against rattlesnake venom and 13 years before Calmette's (1892) work with cobra venom and the immunization of horses. And it was 48 years before the first commercially available rattlesnake antivenom would be available in the United States in 1927 (Pucca et al. 2019).



In 1881, U.S. Cavalry officer and anthropologist, Lt. John Gregory Bourke (Fig. 5), traveled with his 15-member support team from Santa Fe, New Mexico, to the Hopi mesas. Bourke was on a yearlong leave of absence to conduct an ethnographic scouting mission. At age 35, Bourke was a graduate of West Point Military Academy and an experienced combat veteran. He fought in the Civil War and in two Indian wars (the Apaches and the Lakotas). Bourke was a diarist, ethnologist, folklorist, friend of imprisoned Apaches, a recipient of the congressional Medal of Honor, and throughout his life, a professional U.S. Army officer (Lyon 1982).

In September 1871, Bourke was appointed aide-de-camp to General George Crook, commanding the Department of Arizona. Bourke accompanied Crook on trips throughout the Southwest. They visited the Hopi in October 1874, and this experience became the basis for Bourke's first published article (Bourke 1874).

From 1875–1882, Crook commanded the Military Department of the Platte, Omaha, Nebraska, and Bourke was again Crook's aide-de-camp. His interest in science



Fig. 5. Captain John Gregory Bourke, Circa 1865–1882. Bourke was the first to document some of the details of the Hopi dance in 1881.

developed during this period when he met members of the U.S. Geological Survey and the Bureau of Ethnology. Early in 1881, Bourke requested an assignment to full-time ethnological studies of the western Indians. General Philip Henry Sheridan, the Missouri Division commander, recognized the need to know more about the tribes living within the area of his command. He gave Bourke orders on March 26, 1881, to study the Indians south of the Union Pacific Railroad. Thus, Bourke had the resources of the military at his disposal to study indigenous tribes. On April 27, 1881, Bourke was at Fort Wingate, New Mexico, and met Frank Cushing (Lyon 1982). Cushing learned of Bourke's research and told the Hopi to allow Bourke to observe the rain ceremony. Whether Cushing obtained information about the ceremony while he was with the Hopi, or from the popular press is unclear. On August 7, 1881, Bourke, artist Peter Moran, and Bourke's friend Tom Kearns, traveled to visit the Hopi villages. They attended the snake dance at Walpi on August 12. This experience and the Corn Dance at Santo Domingo formed the basis of Bourke's first book, *The Snake-Dance of the Moquis of Arizona*. Writing about how he learned of the snake dance, Bourke (1884:1) stated,

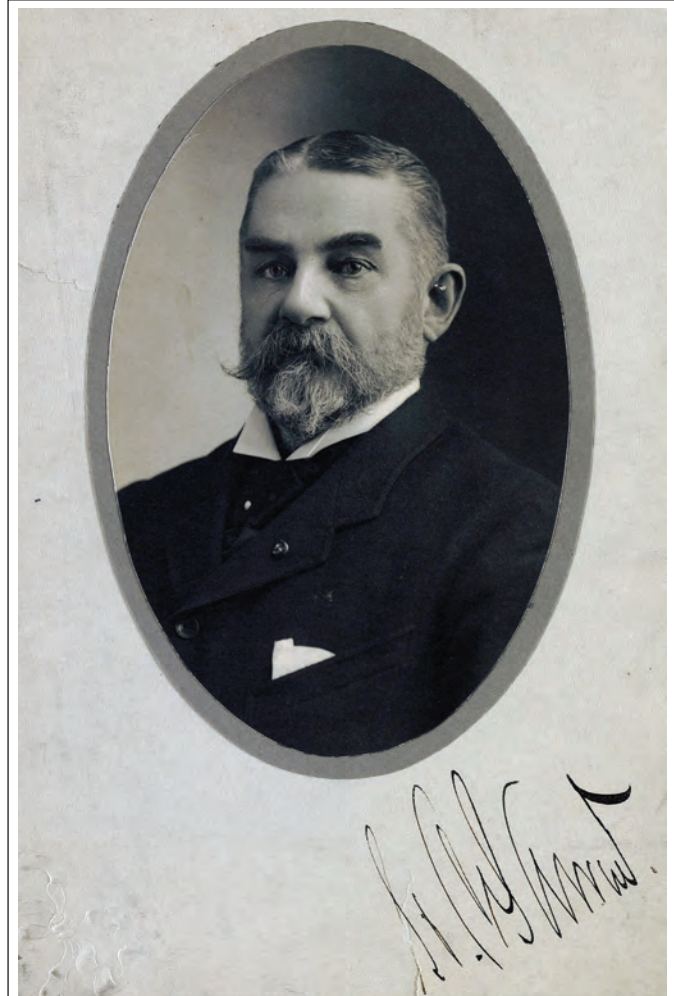


Fig. 6. Henry C. Yarrow, the first herpetologist to view the Hopi snake dance and examine a rattlesnake for the condition of its venom delivery apparatus.

Although vague rumours had from time to time reached me of the peculiar ceremonies to be noticed among the Moquis, I had paid but slight attention to them, as they came from mining prospectors and others of the same genus, who delighted in the marvelous; and I first heard with certainty of the rattlesnake-dance of this strange people from my old friend Mr. William Leonard, then trader at the Navajo Indian Agency, Fort Defiance, Arizona.

Bourke's (1884) contribution to the knowledge of the Hopi ritual was the first detailed description of the snake dance and it furthered public interest, including that of herpetologists such as Henry C. Yarrow (Fig. 6), who attended the 1883 dance.

Yarrow (1888a:172) reported seeing two Hopi bitten by non-venomous snakes during the snake dance. He also described the Hopi antidote as,

...a pale, dirty-green fluid without odor, and slightly bitter taste, but its composition could not be ascertained, only two individuals in the tribe knowing how to prepare it. This preparation is used, mixed with saliva and the charcoal of pinon

nuts, to smear the bodies of those Indians who are to participate in the dance, and after it is finished copious draughts of it are swallowed, which produce prompt emesis. In case one is bitten, which happens occasionally, the wound is immediately sucked, some of the antidote rubbed into the wound, and a large quantity swallowed. During the last ten years, in which period five dances have occurred, but one individual has perished from snake bite; and this is more surprising when the fact is made known that the salient feature of the dance consists in the dancer holding one or two rattlesnakes in the mouth.

There appears to be no comprehensive first-hand account directly from Yarrow's 1883 visit other than a paper that he read at a meeting and was discussed by Mindeleff (1886). Thus, we are mostly dependent on Mindeleff's (1886) description of Yarrow's presentation except for the comments Yarrow published (1888a, b). Yarrow attended the dance at Walpi in 1883 to examine the snakes used in the dance. He identified four species used in the snake dance, the only venomous one being "the spotted rattlesnake, or *Crotalus confluentus*."

Yarrow entered an underground room (a kiva) (Fig. 7) on the eve of the snake dance, found a large rattlesnake being held for the ceremony, opened its mouth, and found the fangs were intact. After the dance, two rattlesnakes were captured and sent to the Smithsonian where physician and snake venom researcher S. Weir Mitchell examined them and confirmed Yarrow's observations—the fangs had not been removed.

Yarrow reported that snakes were washed repeatedly in "medicine-water" over a five- or six-day period but that some snakes captured just hours before the ritual were also used. This led him to suggest that repeated handling was habituating the snakes to human manipulation. During the dance Yarrow observed that the snakes seemed numbed and lifeless but when dropped on the ground from the dancer's mouth they displayed defensive behavior.

The 1883 snake dance was also attended and reported on by Herman Ten Kate (Hovens et al. 2004:249–250), a Dutch explorer and ethnologist. He wrote,

I encountered a row of hideously painted Indians sitting along the wall in the small oblong, square room, busily putting the final touches to their dance toilette. Above their heads were suspended eagle feathers, fox hides, rattles, tortoise shells, and other necessities with which they, the priests of the Order of the Serpent, will initiate the dance later. In a corner lay a heap of



Fig. 7. A Hopi snake priest entering the underground kiva where the snakes are held and the washing ceremony is performed. This image is one of a series of postcards produced by the Fred Harvey Corporation to promote tourism in the southwest.

live snakes, incessantly writhing about which are kept under control by an Indian waving a bundle of feathers. In the middle of the estufa stood a clay basin, filled with a pale brown liquid that had an astringent taste and with a large white seashell, serving as a drinking bowl, floating on top of it. The liquid was an antidote for snakebite, which the priests had been drinking for days while fasting...

Ten Kate's description of the dance differs slightly from Bourke's but the differences are to be expected given that they occurred on different mesas.

Building on the observations of Bourke (1884), J. Walter Fewkes (1894:85), anthropologist, naturalist, and writer described his reaction to the snake dance (Fig. 8) as a sight that

... haunted me for weeks afterwards, and I can never forget this wildest of all the aboriginal rites of this strange people,



Fig. 8. A Hopi snake priests carrying gopher snakes (*Pituophis catenifera*) in his mouth. Photo from the Library of Congress.



Fig. 9. Hopi snake dance ceremony based on a painting from E. Irving Couse. This is a postcard from the Fred Harvey Corporation to promote tourism in the southwest.

which showed no element of our present civilization. It was a performance which might have been expected in the heart of Africa rather than in the American Union, and certainly one could not realize that he was in the United States at the end of the nineteenth century.

Later in the same article, Fewkes (1894:124) described the ritual as,

...an elaborate prayer for rain, in which the reptiles are gathered from the fields, intrusted with the prayers of the people, and then given their liberty to bear these petitions to the divinities who can bring the blessing of copious rains to the parched and arid farms of the Hopi.

Fewkes, a member of the Smithsonian's Bureau of American Ethnology, published extensively on the Hopi snake ritual (Fewkes, 1894, 1895, 1898, 1902). He considered the snake dance as a serious ancient ritual which survived from prehistoric times to the present day. In discussions with the Hopi priests, he realized none of them understood the meaning of all the details of the dance. It appeared to be an ancient ceremony culturally passed from one generation to the next and filled with small changes in knowledge regarding why the various components exist or what they meant (Fig. 9).

Bourke (1895:193–194) also suspected that snake

ceremonies among North America's indigenous people were more widespread than just the Hopi ceremony. He wrote,

Great as has been the work accomplished, it is not yet perfected. Connection must be established between the Moqui form of the snake dance and any variants which may exist, as I am inclined to suspect they do still exist among the people of Acoma, Sia, Jemez, or Zuñi, as well as among the Mohave and Apache. It will be of interest to note that the Apaches took me to their sacred caves in the Pinal range and the Sierra Ancha, and on the way we stopped at and prayed to stone heaps exactly like those described by Dr. Fewkes (p. 41). In these caves the Apaches showed me phallic symbols in stone and pointed out where their medicine-men stood with naked feet and danced about among rattlesnakes. They also asserted that their medicine-men would take little rattlesnakes in their mouths and swallow them. Incredible as this may seem, it is strictly in line with what has been related of the Aztecs by early Spanish authors.

Not all ceremonial attendees were interested in the origins and meaning of the snake dance. An observer at the 1885 snake dance wrote, "So ended the snake dance, and a more revolting exhibition of savagery (Canibalism [sic] not excepted) does not mar the face of history." (Anonymous 1885).

HOPÍ SNAKE HANDLING

As word of the snake dance spread, interest grew. Including the question: do the Hopi know something about snake bite treatment that Euro-American science does not? Did they discover an efficacious treatment for snake envenomation? Mindeleff (1886:12) comments on Yarrow's interview with a snake priest after a dance. Yarrow showed the man a syringe full of potassium permanganate. (At the time this was considered a treatment for snake envenomation.) The Hopi replied, "No doubt my brother's medicine is good, but we are quite satisfied with our own." Mindeleff (1886) also quotes a letter from a Mr. Trumble (*Science* vii, June 4) who proposed the snakes are overfed prior to the dance making them lethargic and less likely to bite.

Rejecting the idea that the snakes were drugged, Voth (1903:341–342) proposed the following.

While I do not pretend to be able to fully explain the matter, I offer the following suggestions: (1) The repeated handling of the snakes undoubtedly makes them more or less gentle. There is no question but what the priests are more afraid of the snakes when they first capture them than later. One of them, in explaining to me the details of the snake hunt, emphasized the fact that they at once commence to "tame" them by careful handling and by slowly stroking them, and when I asked him why so very seldom one was bitten by any snake, he said he could only explain it by the careful handling of the snakes. He said they never hurt the snakes and hence the latter became used to them and were not afraid of them. He compared the case with that of a wild pony, which, when first caught, would "kick, bite, and jump," but when repeatedly and carefully handled would become gentle; (2) The snakes, being often touched by the points of the snake whips, become used to seeing objects over themselves and to being touched by them, and hence do not find it so strange when a hand reaches towards or touches them. It must be added, however, that if this point explains anything, it does so to a limited extent only, as snakes are brought in even up to the last days, which from the very nature of the case have been handled but very little; (3) The principal explanation, therefore, does not, I believe, lie in the frequency of the handling, but rather in the manner in which it is done. I have again and again seen the snakes picked up in the kivas and on the plazas, put into and taken out of the jars, jugs, and bags, not only in Oraibi, but in all the other villages, by the old experienced priests as well as by the novices, but only very seldom have I seen one reach after or grasp a reptile with a quick, jerking, hesitating movement of the hand, and even on those few occasions the snakes were generally trying to get away, at least they were not in a proper position to strike when taken. Under ordinary circumstances the movement of the hand, in trying to take a snake is slow, gentle, but sure and unhesitating. I saw old, half-blind Nuva-kwahu reach towards several snakes, that with heads raised and drawn back, were watching the approaching hand, and that probably would have struck, since they were at

least partly coiled, had they noticed the least twitching or jerking motion of the hand; (4) Never, at any time, have I seen even the most experienced member of the Fraternity try to take a snake when the reptile was entirely coiled up. They seem to be convinced, and in fact have told me, that a rattlesnake does not strike unless entirely coiled up or at least nearly so. If a snake does coil up it is invariably first induced to uncoil by waving the snake whip over it.

Few outsiders have been able to observe a Hopi snake hunt and those that have were on unsuccessful hunts. In his Appendix 1, Klauber (1932:68) considered the only firsthand, eyewitness account of a successful Hopi snake hunt to be that reported in a newspaper article by Stephen and Messinger (1889:9), who wrote,

Presently they (Snake priests) broke into groups of two and three and began cautiously to, peer and poke among rocks and bushes for the snake mother's children. In a short time a low call came from a man who was thrusting his stick into a dense clump of greasewood, and as the hunters gathered there it was found to be a large rattlesnake lying in the heart of the thicket. Without hesitation they at once proceeded to cut away the bushes with, their hoes, and strangely enough, although the snake lay in coil and watched them, it made no rattling or other display of anger. One of the twigs fell upon it, and the man nearest stooped down and deliberately lifted the branch away.

Each one then sprinkled a pinch of meal upon the snake, and the man who had found it bent over and rapped it lightly with the feathers of his snake-whip. It swayed its head a little and then straightened out to make off, but just as it relaxed from coil, the hunter, using the right hand, in which he held his snake-whip, instantly seized it a few inches back of the head. Holding it out, he gave it quick shake, and then proceeded to fold it up, and put it in one of the small bags carried for this purpose, showing no more concern in its handling than if it had been a ribbon.

However, in the body of his paper, Klauber (1932:19) suggested the snakes are handled with more care prior to the washing. He wrote,

When a snake has been found, it is picked up immediately behind the head if outstretched; or, if it coils and shows fight, it is teased and brushed with one of the feathered snake-wands until it uncoils and attempts to escape, whereupon with great quickness it is seized behind the head and handled in a safe manner. The catches are deposited in the snake bags carried for the purpose. Many hunts result fruitlessly for numbers of the priests engaged, a situation which will gain the sympathy of the field herpetologist.

The snake priests were very secretive regarding how they captured rattlesnakes. Fewkes (1895) called the chief snake priest's attention to a hole into which he had seen a rattler take refuge, but the chief would not dig it out "in my presence, so

carefully do they preserve this one feature of the ceremony, the capture of the reptiles in the open.”

On Saturday, August 15, 1931 Laurence Klauber and his son Phillip left California for the 1931 Hopi Snake ceremony at Mishongnovi on Second Mesa. By Saturday evening they were in Williams, Arizona, and left town by 8AM Sunday headed for the Grand Canyon where they met herpetologist Charles Bogert and Grand Canyon National Park naturalist Edwin McKee.

Based upon his experience and the literature, Klauber (1932) published a detailed report and analysis on the Hopi snake dance. He estimated the number of people attending the 1931 dance was about 750. He also identified four species of snakes used during the ceremony. Confirming Yarrow's observations, he found only one was venomous, *Crotalus confluentus* (now *Crotalus viridis*). In addition to the rattlesnake, Klauber confirmed the use of the gopher snake, *Pituophis catenifer*, and the whipsnake, *Masticophis taeniatus*. Klauber suspected the fourth species was the Glossy Snake (*Arizona elegans*) but could not confirm it because it was seen at a distance.

The snake priests perform a dance and procession with many of them holding snakes several inches behind the head (giving the snake an opportunity to bite) or they hold them in their mouths at mid body. Again, giving the snake an opportunity to bite. Klauber summarized ten bites reported by observers of the dance. Klauber (1932:19) did not directly observe the Hopi catching snakes but based upon the literature and descriptions from some of the snake priests, he wrote,

Not only are snakes taken where found resting in the shade under bushes, but likewise a definite effort is made to secure them by following their tracks, and the Snake priests work energetically in excavating holes into which tracks give evidence that snakes have sought refuge. These excavations are made with Indian digging sticks, or more often in recent years with hoes; these tools can be used for no other purpose during the ceremony. Dorsey and Voth (1902, p. 183) observed that the Indians apparently had no fear in plunging their hands to the bottom of holes which were presumed to contain snakes.

Following this, Klauber (1932:20) writes,

All observers agree that there is incautious (but not inconsiderate) handling of snakes within the kiva during these days of ceremony. Both rattlers and harmless species, when at liberty, roam about amongst the priests and have little or no attention paid to them. During certain of the rites they are herded to one side, usually by means of the snake-wands. When it is necessary to handle them, as, for instance, when they are returned to the jars, or during the final washing ceremony, no effort seems to be made to manipulate the rattlers safely by holding them immediately behind the head; on the contrary they are picked up quite at random. One photograph of the washing ceremony demonstrates definitely that the rattlers are not grasped behind the head.”

Klauber observed that the snakes seemed to have little energy when dropped, sometimes violently. They would just try to escape and not display the very distinctive rattlesnake defensive behavior. Eventually, all the snakes are thrown into a single pile by the dancers and the snakes can move away in all directions. The snakes are then gathered up, the dance ends, and the snakes are released in the desert.

Mateer's statement about a Hopi antidote was investigated by Coleman (1928). He secured a pint of the antidote and stored the mixture in a refrigerator for two months. Then tested it with dried rattlesnake venom and guinea pigs. He found it totally ineffective. That said, the experimental methods used would be questioned today.

Photographer Edwin Curtis (1922) suggested the fangs were removed and, in fact, Bogert (1933, 1941) collected a specimen released after a dance and sent it to Klauber for inspection. Klauber found it did indeed have its fangs removed—a change from what Yarrow and Mitchell (Mindeleff 1886) had previously found. Yet the main conclusion in Klauber's (1932) paper was that the snakes were habituated to handling and the Hopi were skilled at handling them. The same conclusion was reached by Yarrow.

Observations of the Hopi snake dance post-Klauber were discussed by writer Frank Waters. Waters lived with several indigenous societies and wrote about them in both novels and non-fiction works (Kishbaugh 2017). In his *Book of the Hopi*, Waters (1977) describes a 16-day *Chu'iva* (snake dance) by the Snake-Antelope Ceremony using descriptions related to him by participants and observers and is second hand but provide the Hopi perspective on the ritual.

The snakes are collected over four days, each day the hunters move in one of the four cardinal compass directions (west, south, east, and north – in that order) in search of snakes. Waters informant on snake gathering was a Hopi named Watchful Bee. The hunters carried a jar of water, corn meal, and a *kwáwíckí*. The *kwáwíckí* is two vulture feathers tied together. Watchful Bee was told by his grandfather that the feathers have gray spots on them that have a strange odor and the power to calm an angry snake. If a snake is coiled the feathers are waved at the snake causing it to become calm and uncoil at which time it can be picked up.

Watchful Bee was afraid of finding a rattlesnake knowing they are venomous, but he was told he should collect a rattlesnake on the first day rather than a far more dangerous bullsake that could suck the life out of a man's body. A statement like this seems to be a confidence building strategy on the part of the snake priests.

The account continues with Watchful Bee collecting a racer that was dug out of a rodent burrow. The snake was blessed with corn meal but became agitated and struck at Watchful Bee. He held the snake behind the head, spat in the hand not holding the snake and brushed the snake with his hand. The snake went limp.

The snakes were held in the kiva, and Watchful Bee noted the Snake Chiefs smoked in the room every night.

The snakes were held in jars covered with buckskin perforated with holes. In the evening the snakes were fed corn pollen.

Watchful Bee reports that about midnight the Snake chiefs returned to snake kiva for deep concentration, a blessing, and entertaining the snakes. Waters added a footnote to pages 221–223 that states that the fangs are not extracted, nor are the venom glands emptied. He comments on bites that occur without any effects, because snake dances take a mixture of *chu'knga* as snake medicine. Some is taken orally, and some is rubbed on their hands before going snake hunting. If a bite occurs in the kiva it is rubbed on the wound. The mixture is made from the leaves of the *hohoyawnga* (stinkbug plant), the root of the *chu'si* (snake flower), and leaves of the plant *chu'ôqwpi* (snake vertebrae). The plant parts are boiled in water and then blessed.

The Hopi perspective on rattlesnake bites is that they only occur when the snake senses fear or anger from humans and that snakes will only bite when they are coiled (Stephen and Messinger 1889; Klauber 1932; Waters 1977).

CROTALUS VIRIDIS AND ITS VENOM

The rattlesnakes used by the Hopi are part of the Western Rattlesnake Complex (WRC; Davis 2016), a diverse assemblage of closely related rattlesnakes occupying nearly all the United States west of the 100th Meridian. Throughout the 19th century, numerous specimens were collected by mostly military expeditions to the American West and shipped to the Smithsonian Institution where they were sorted, described, and named. The first documented WRC rattlesnake was collected in “the Upper Missouri” and described in 1818 by C. S. Rafinesque. For more than a century thereafter, biologists added specimens and classified, named, and renamed the various forms.

Four years after witnessing the Hopi snake dance in 1931, Klauber described a new “stunted subspecies” in the WRC from the area as the Arizona Prairie Rattlesnake, *Crotalus confluentus nuntius*. Describing his selection of the subspecific epithet, he wrote, “*Nuntius*, the messenger. In the Hopi Snake Ceremonial, these snakes are used as messengers to gods of the underworld” (Klauber 1935).

Compared to 1,900 specimens of the nominate form, *confluentus confluentus*, the 200 specimens of the form he named *nuntius* were smaller in size, reddish-brown in coloration, and had lower dorsal and ventral scale counts, suggesting that subspecific designation was warranted (Klauber 1935).

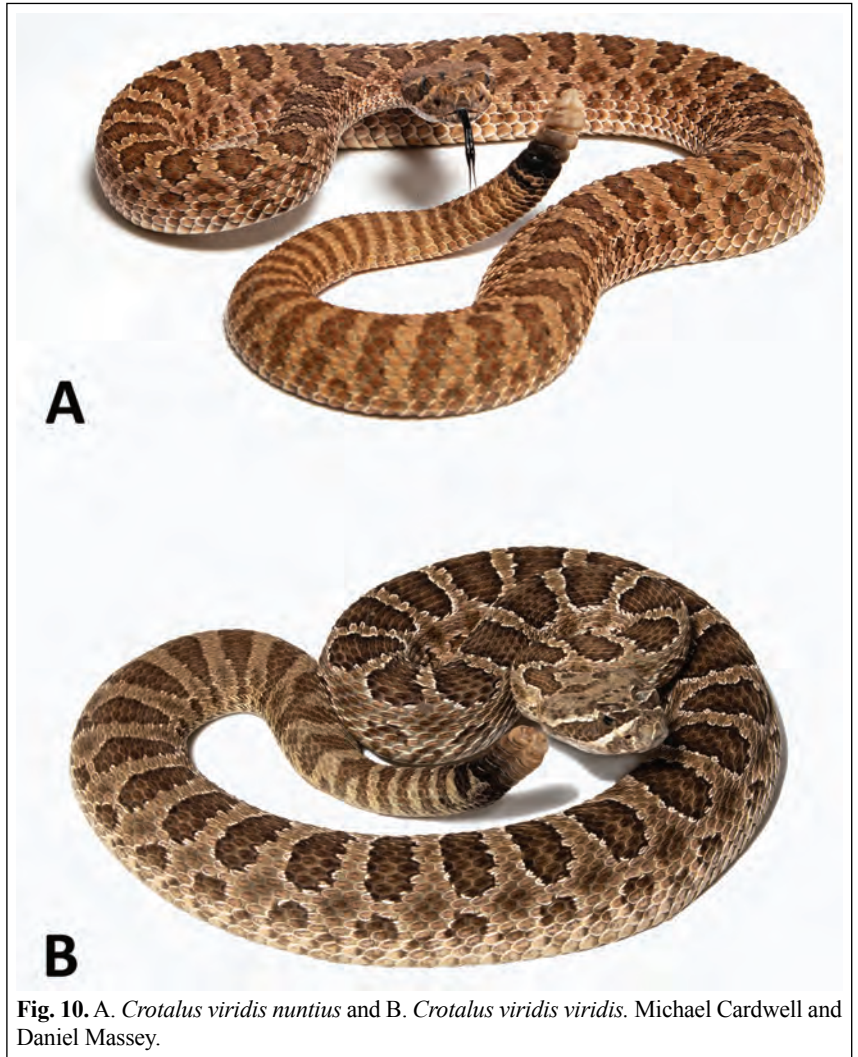


Fig. 10. A. *Crotalus viridis nuntius* and B. *Crotalus viridis viridis*. Michael Cardwell and Daniel Massey.

Eventually, Klauber synonymized the two specific epithets widely used within the WRC, *confluentus* and *viridis*, as *viridis* (Klauber 1936). By 1956, he recognized nine subspecies, including *Crotalus viridis nuntius* (Klauber 1956). But as the 21st century dawned, new genetic studies revealed a clear evolutionary divergence between eastern and western lineages, separated by the continental divide. As a result, all but two forms of the WRC were renamed *Crotalus oreganus*, leaving the eastern lineage comprised of only *Crotalus viridis nuntius* (Fig. 10a) and *Crotalus viridis viridis* (Fig. 10b).

In the first edition of his tome *Rattlesnakes*, Klauber (1956) continued use of the common name Arizona Prairie Rattlesnake. But in the same year, Conant and his committee of nomenclature experts published the common name “Hopi Rattlesnake” for *Crotalus viridis nuntius* (Conant et al. 1956) without stating their rationale. Hopi Rattlesnake was immediately adopted by other authorities, including by Klauber in the second edition of *Rattlesnakes* (1972), and is universally used for this rattlesnake today.

We note that Klauber found classification of *Crotalus viridis* from the Little Colorado River drainage problematic,

complicated by the fact that the Hopi often brought in rattlesnakes for the snake dance from areas distant to the reservation. Klauber (1935) observed both subspecies in the snake dance. Despite the transport of snakes from areas away from the reservation activity, Klauber indicated that individuals from the San Juan drainage area in northeastern Arizona were *C. v. viridis*. He (Klauber, 1930) stated that specimens typical of *confluentus* (= *C. v. viridis*) were captured "...as far westward as the Santa Fe's branch line to the Grand Canyon" (at Williams, Arizona, about 52 km west of Flagstaff). This is not the only example of the Hopi transporting reptile resources used in the snake dance; Bettelheim (2020) found the Hopi obtained Western Pond Turtles from California and used their shells as rattles.

The venom of the nine historic subspecies that previously comprised the WRC (*C. oreganus* = 7 and *C. viridis* = 2) were investigated by Mackessy (2010). He found that *C. v. nuntius* and *C. v. viridis* have the second and third most toxic venoms, respectively, based on lethality studies in mice. *Crotalus v. nuntius* venom contains high levels of tissue-destroying metalloproteinases, moderate levels of myotoxins, and no PLA₂ neurotoxin. But the venom yield of *C. v. nuntius* was found to be the smallest of the group, which is not surprising, because it is the smallest animal and venom yield varies exponentially with length. Saviola et al. (2015) described 175 bites by *C. viridis* in Colorado over a period of four years with no fatalities, suggesting death from this species is unlikely with access to modern medicine.

Although the story may be different without modern medicine, lethality (LD₅₀) studies in mice have not always translated well to people. For example, initial mouse studies indicated that CroFab™ antivenom was significantly less efficacious against *C. oreganus helleri* (southern Pacific rattlesnake) venom than the venom from other rattlesnakes (Protherics 2000), yet subsequent clinical experience demonstrated otherwise (Bush et al. 2002). And mouse LD₅₀ studies have repeatedly indicated that neurotoxic (venom-A) Mohave rattlesnakes (*C. scutulatus*) are one of the deadliest rattlesnakes yet human deaths are rare despite many annual bites (summarized by Cardwell 2020). With the limited distribution of the Hopi rattlesnake and relatively few recorded human bites, characterization of the sequelae of bites in humans remains challenging.

SNAKES AND TOBACCO

Herpetologists have proposed that the Hopi avoid envenomation by cautious handling, habituation to handling, extraction of fangs, and drugging the snakes. Sedating snakes has been mentioned but no one seems to have discussed the substance used or the details. The obvious strategy that seems to have been overlooked or outright rejected is exposing the snakes to tobacco in multiple ways.

In the very first articles describing the snake dance (Anonymous 1879; Mateer 1879) William Mateer speculated

about the snakes being "stupefied" during the snake dance. Bourke (1884:178) noted the kivas, where the snakes were kept, were filled with tobacco smoke as the dancers prepared for the performance. He (Bourke 1884:259) further notes that tobacco is used in religious ceremonies of all southwest Indians. This is documented by a photograph Waters (1977: photos between pages 190–191, third to the last image) provided a photograph of two snake priests in the kiva sitting near the snake altar and two pipes are visible in the foreground. This may be the best photographic evidence of smoking in the kiva associated with the snake dance ceremonial.

Fewkes (1898) discussed the snake washing ceremony that occurs about noon on the day of the snake dance. The dance occurs at sunset. He observed the ritual four times (Fewkes 1891, 1893, 1895, 1897). The snake washing is performed by the priests in a kiva. The following are relevant observations from Fewkes (1898:315–318).

After all of the priests were seated, except a few in charge of the bag of snakes and two or three lads who stood in the middle of the *kiva* back of the line of seated men, the Snake chief made symbols of sacred men on a hillock of sand before him. Upon the hillock he then deposited a large earthen wash bowl, such as is used in bathing the head, and poured liquid into this bowl from the north, west, south, and east sides, following a sinistral ceremonial circuit. Pinches of sacred meal were then dropped into the liquid, first on the north side, then on the west, south, and east, adding two more. One for the above and another for the below. The chief then took from his mouth a fragment of chewed root and dropped it also into the bowl. All remained silent during these acts, and soon a lighted pipe was passed from one to another of the priests, beginning with the chief, who puffed great clouds of tobacco smoke into the liquid and to the cardinal points in the prescribed circuit.

Soon after the priests began to sing, I noticed that the man with the bag of reptiles handed the snakes to the chief and his neighbors, and that they plunged the reptiles into the bowl before them, later depositing the snakes on the sand covering the floor. While this transpired the singers kept on with their songs and other snakes were handed to the chief, who plunged into the liquid and placed them on the sand. The floor enclosed by the row of sitting priests was soon covered with a mass of writhing reptiles, and rapidly moving species darting from one end to the other of the sanded area, the rattlers, which move in a more deliberate way, extending themselves at length or coiling for defense....

It has been suggested that the liquid is a stupefying compound into which they are introduced to render them more tractable when carried on the plaza a few hours after. I find no good evidence that such is the object of the washing, nor do I believe that any means are adopted to stupefy them....

The Snake washing at Miconinovi, and the same may probably be said of that at Oraibi, Cipaulovi, and Cunopavi, is a tame affair as compared with that at Walapi, which has

always seemed to me the most fearless episode of the Snake dance. When the snakes are removed from the jars, at the last pueblo, the Snake men fearlessly plunge their hands into receptacles filled with reptiles, any one of which might strike them...I have witnessed the Walapi Snake washing four times I have never seen one of the men bitten.

The effects of tobacco (Solanaceae) have been well studied in humans but relatively few studies have examined the impact of tobacco smoke or a tobacco tea (tobacco leaves soaked in water) on snakes. Nicotine is the primary psychoactive compound associated with tobacco (Perkins et al. 1994). The oral and dermal toxicity of nicotine and other chemicals to the Brown Tree Snake (*Boiga irregularis*) was evaluated by Brooks et al. (1998). Nicotine produced 100% mortality when applied dermally at a dose of 40 mg/kg. This implies that snakes are extremely sensitive to nicotine. For comparison purposes the nicotine per cigarette is about 8 mg, while total nicotine per cigar ranged from 5.9 to 335.2 mg. Nicotine concentrations ranged from 10.3–19.1 mg/g in small cigar tobacco but average concentrations (12.6 mg/g) were lower than those in cigarettes (19.2 mg/g) (Henningfield et al. 1999; Benowitz et al. 2006; Lawler et al. 2017).

Burning tobacco produces not only the smoke inhaled and then exhaled by the smoker, but also a side stream of unfiltered tobacco smoke coming directly off the cigarette or pipe bowl. The exhaled smoke is second-hand smoke, while the side stream smoke has not been filtered through the lungs. Nonsmokers exposed to secondhand smoke had hair nicotine levels comparable to active smokers (Al-Delaimy et al. 2001; Dimich-Ward et al. 1997; Okoli 2007). The point is that Hopi priests preparing snakes for handling in the kiva are exposing the snakes to nicotine via the respiratory system and most likely through their skin via the “medicine water” used during the washing ceremony.

The broadly defined Hopi theory of medicine and its use of charms to influence gods, men, and animals or to cure an upset stomach was discussed by Hough (1898). These charms are all plant-based and Hough provides a list of about 40 plants used for everything from growing hair to stimulating childbirth. Of all the plants used by the Hopi, Hough only considered two species of tobacco to be narcotics. The Hopi gather and sometimes grow Coyote Tobacco, *Nicotiana attenuata* and Desert Tobacco, *N. trigonophylla* (Adams et al. 2015). There are at least six species of tobacco native to Arizona. A seventh invasive species, Tree Tobacco, *Nicotiana glauca*, is thought to have been present only during the last century and there is no evidence the Hopi use this species.

The Hopi mix one of two native tobacco species together with other plants to produce *yoyviva* (rain tobacco) and *omawviva* (cloud tobacco)—the association of smoke with clouds and rain (Malotki and Gary 2006:xxxviii) is obvious. The cloud tobacco is a mixture of wild tobacco, corn pollen, yellow feathers, and other plant material (Winter, 2000). The rain tobacco is a mixture of Mullein, *Verbascum* sp.

(Scrophulariaceae); Purple Sage, *Salvia dorrii* (Labiatae); and Giant Trumpets, *Onosmodium thurberi* (now *Lithospermum macromeria*) (Boraginaceae) and tobacco to create sacred tobacco thought to be more effective in producing rain. All these plants have compounds that effect the nervous system (Baricevic and Bartol 2005). However, Moerman (1986) reports *Verbascum* and a related species, *Salvia carnososa*, contain anticonvulsant, while *Onosmodium thurberi* is considered by the Hopi a cure for witches, fits, and mental illness.

In Fewkes’ account (1898:315–318; quoted above), he observed the chief was chewing a root that was added to the water, and that the men all blew tobacco smoke into the water. Voth also studied the Hopi at the turn of the 20th century and made observations that suggest tobacco smoke was used to drug the snakes. This is evidence contrary to what he said in the quote above. He (Voth 1903:292) wrote,

If a reptile refuses to uncoil, the party or parties sit down near it and begin to smoke, blowing the smoke toward it. Should a certain party absolutely fail to take such a coiled snake, he infers that his “heart is not good,” and that the snake is angry. Another man is then called to try the experiment, and if he fails, another one, etc.

In a footnote, Voth (1903:293) commented, “I have never seen the individual hunter take tobacco and pipes with them, but this smoking towards a rebellious reptile has been mentioned to me several times.” Like Bourke, Voth (1903:289) also describes the chief snake priests and other men smoking in the snake kiva during the ceremonial days leading up to the dance where the snakes collected for the snake dance are housed. He also contradicts himself, on page 286 where he specifically states the chief priest carries tobacco and pipes on the snake hunt.

The chief priest carries in a bundle, a pouch with tobacco, some pipes, and some food — especially piki. All are attired in a common kilt and moccasins, the body decoration consisting of a pinkish spot on the lower and upper leg, lower and upper arm, forehead, and on each side of the sternum and the spine.

There is another plant possibly involved in altering the snakes’ behavior. The Hopi chew the Basin Bladderpod (*Lesquerella cinerea*) during the snake ceremony. It is chewed and spit out. There appears to be no evidence it contains psychoactive molecules (Voth 1903:286). However, the Western Jimson Weed, *Datura wrightii*, does contain a hallucinogen (scopolamine) and the Hopi are known to chew its root (Whiting 1939; Colton 1974). Confusion about which plant was being used during the ceremony cannot be ruled out.

The suggestion that fangs were removed was previously discussed. Bogert and Klauber found a snake that did indeed have its fangs removed—a change from what Yarrow and

Mitchell had previously found. Snake handlers the world over have a variety of strategies for avoiding envenomation. Some simply assume the risk of being bitten, some habituate the snake to handling reducing the risk of a bite; yet others, who are more cautious, alter the snakes by removing fangs, plugging fangs with wax, or sewing the mouth closed (Buckland 1899; Villiers 1975; Minton and Minton 1980).

Considering the Hopi's extensive knowledge of medicinal plants, the observations of Fewkes and Klauber suggesting the snakes appeared drugged (stupefied), and the lack of caution taken by the snake priest during the dance (holding snakes insecurely and holding them in their mouths) and tobacco use in the kiva for a period of days prior to the ritual, suggests to us the snakes were under the influence of nicotine poisoning. The observations of Bogert and Klauber of snakes used in the 1933 snake dance provides evidence that some performers took the extra precaution of removing the fangs and may represent one of the variations in the ritual between villages and performers as noted by Whiteley (1988).

So, is there a way to test for the presence of nicotine in the water used by the Hopi during the washing ceremony? Yarrow obtained a sample of the liquid used during the washing ritual after the 1883 dance and Mindeleff (1886) stated that it is in the army medical museum. Recent attempts to locate Yarrow's sample have been unsuccessful.

Tobacco use is widespread in cultures around the world. Archeological evidence suggest the Maya were using tobacco in the first century BC in sacred ceremonies (Goodman 2005). Therefore, its use by the Hopi to intoxicate rattlesnakes seems a possibility and when combined with other precautions (habituating the snakes to handling and fang removal) to avoid bites the dancers reduced their overall risk of envenomation.

In summary, previous literature on the snake dance is unclear when and how news of the ritual was discovered by Euro-Americans. Klauber (1932) suggested the news broke in 1881 in the *Presbyterian Messenger* and Udall (1992) suggest the story was first released in a publication called *Masterkey* in 1879. Udall's article suggests a former Indian Agent for the Hopi, William Mateer, released the story in 1879. We were unable to locate the publications *Masterkey* or the *Presbyterian Messenger* discussed in earlier literature. Using newspaper archives, we can confirm that William Mateer did report the story to the press in 1879, the oldest article was dated September 25 and appeared in the *St. Louis Globe Democrat*. Hypotheses suggesting how the Hopi avoided envenomation by rattlesnakes during the ceremonial dance included: removal of fangs, habituating the snakes to handling, and drugging the snakes. Most of the authors writing about this concluded that habituation to handling was used to avoid envenomation. We suggest that the snakes were saturated with nicotine via the respiratory systems and absorbed nicotine via their skin when they were washed with medicine water. This treatment poisoned the snakes so that it was unlikely dancers would be bitten. However, there is at

least one documented case of the fangs being removed from the snake.

ACKNOWLEDGEMENTS

The authors thank Christopher Bell for drawing our attention to the Ten Kate translation (Hovens 2004). We also thank two anonymous reviewers whose suggestions improved the manuscript.

REFERENCES

- Adams, D. K. and A. C. Comrie. 1997. The north American monsoon. *Bulletin of the American Meteorological Society*. 78(10):2197–2214.
- Adams, K. R., K. L. Johnson, and T. M. Murphy. 2015. Prehistoric Puebloan yucca (*Yucca*) quids with wild tobacco (*Nicotiana*) contents: Molecular and morphological evidence from Antelope Cave, northwestern Arizona. *Journal of Field Archaeology*. 40(3):310–324.
- Al-Delaimy, W.K., J. Cranem and A. Woodward, A. 2001. Passive smoking in children: effect of avoidance strategies at home as measured by hair nicotine levels. *Archives of Environmental Health: An International Journal*, 56(2):117–122.
- Anonymous. 1879. The snake dance. A wonderful story told by an Agent of the Moquis Indians. *St. Louis Globe-Democrat* September 25, 1879, p. 10.
- Anonymous. 1885. Dance of the Moquis, Red Revelers who Reel with Rabid, Rattling Reptiles. *Arizona Champion, Flagstaff, Arizona Territory*, Saturday September 5, 1885. Vol. II, Number 104. Page 1. [Note this article is signed J.C.B.]
- Arizona Department of Health Services. 2020. Hopi Tribe Primary Care Area (PCA) 2020 Statistical Profile. Bureau of Women's and Children's Health.
- Baricevic D. and T. Bartol. 2005. V. Pharmacology 11. The biological and pharmacological activity of the *Salvia* genus. Pp 143–184. In: S. E. Kintzios (Editor) *Sage the genus Salvia, Medicinal and aromatic plants—Industrial profiles*. Hardwood Academic Publishers, The Netherlands.
- Benowitz, N. L., P. Jacob III, and B. Herrera. 2006. Nicotine intake and dose response when smoking reduced-nicotine content cigarettes. *Clinical Pharmacology & Therapeutics* 80(6):703–714.
- Benson, L. V., E.M. Hattori, J. Southon, and B. Aleck. 2013. Dating North America's oldest petroglyphs, Winnemucca Lake subbasin, Nevada. *Journal of Archaeological Science*, 40(12): 4466–4476.
- Bettelheim, M. P. 2020. Tewaquaptewa, Trailfinders, and Turtles – the unexpected origins of Western Pond Turtle Shells in the Hopi Snake Dance. *Bibliotheca Herpetologica* 14(8):51–60.
- Bogert, C. M. 1933. Notes on the snake dance of the Hopi Indians. *Copeia* 1933(4):219–221.
- Bogert, C. M. 1941. Hopi snake dance. *Natural History* 48 (May 1941):276–283.
- Bourke, J. G. 1874. *The Moquis of Arizona*. 8 pp. San Francisco.
- Bourke, J. G. 1884. *Snake-dance of the Moquis*. The University of Arizona Press.
- Bourke, J. G. 1895. News and Notes. The Snake Ceremonials at Walpi. *The American Anthropologist* 8:192–198.
- Brooks, J. E., P. J. Savarie, J. J. Johnston. 1998. The oral and dermal toxicity of selected chemicals to brown tree snakes (*Boiga irregularis*). *Wildlife Research* 25(4):427–35.

- Buckland, W. A. 1899. Remedies for snake-bite: scientific and empiric. *The Westminster Review* 151:182–196.
- Bush, S. P., S. M. Green, J. A. Moynihan, W. K. Hayes, and M. D. Cardwell. 2002. Crotalidae Polyvalent Immune Fab (Ovine) antivenom is efficacious for envenomations by Southern Pacific Rattlesnakes (*Crotalus helleri*). *Annals of Emergency Medicine*. 40:619–624.
- Calmette, A. 1892. Étude expérimentale du venin de *Naja tripudians* ou cobra capel et exposé d'une méthode de neutralisation de ce venin dans l'organisme. *Annales de l'Institut Pasteur*. 1892:6(3):160–83.
- Cardwell, M. D. 2020. *The Mohave Rattlesnake and How It Became an Urban Legend*. ECO Publishing, Rodeo, NM.
- Coleman, G. E. 1928. Rattlesnake venom antidote of the Hopi Indians. *Bulletin of the Antivenin Institute of America* 1(4:97–99).
- Colton, H. S., 1974. Hopi History and Ethnobotany. Page 306 in: D. A. Horr (ed.) *Hopi Indians*. Garland, New York.
- Conant, R., F.R. Cagle, C. J. Goin, C.H. Lowe, W. T. Neill, M. G. Netting, K.P. Schmidt, C.E. Shaw, R. C. Stebbins, and C. M. Bogert. 1956. Common names for North American amphibians and reptiles. *Copeia*, pp.172–185.
- Curtis, E. S. 1907–1930. *The North American Indian. 20 volumes, with photographic supplements*. Plimpton Press, Norwood, MA.
- Curtis, E. S. 1922. Volume 12. The Hopi. *The North American Indian. 20 volumes, with photographic supplements*. Plimpton Press, Norwood, MA.
- Davis, M. A. 2016. The Western Rattlesnake Complex: 200 years of intrigue and change. Pp 39–43 in: G. Schuett et al. (eds.) *Rattlesnakes of Arizona, species accounts and natural history*. Vol. 1. Eco Publishing, Rodeo, New Mexico.
- Dimich-Ward, H., H. Gee, M. Brauer, and V. Leung. 1997. Analysis of nicotine and cotinine in the hair of hospitality workers exposed to environmental tobacco smoke. *Journal of Occupational and Environmental Medicine*, 39(10):946–948.
- Donaldson, T. 1893. *Moqui Pueblo Indians of Arizona and Pueblo Indians of New Mexico. Eleventh Census of the United States Robert P. Porter Superintendent. Extra Census Bulletin*. Washington DC, United States Census Printing Office, 124 pages.
- Dorsey G. A. and H. R. Voth. 1902. The Mishongnovi ceremonies of the Snake and Antelope fraternities. *Field Columbian Museum. Publication 66. Anthropological Series* 3(3):162–261.
- Fewkes, J. W. 1891. Suggestion as to the Meaning of the Moqui Snake Dance. *Journal of American Folk-Lore*, 4(13):129–138.
- Fewkes, J. W. 1893. A Central American Ceremony which Suggests the Snake Dance of the Tusayan Villages. *American Anthropologist* 6(3):285–306, plates 1–4.
- Fewkes, J. W. 1894. The Snake Ceremonials at Walpi. *Journal of American Ethnology and Anthropology* Volume 4 Houghton Mifflin, Boston, 126 pp.
- Fewkes, J. W. 1895. A Comparison of Sia and Tusayan Snake Ceremonials. *American Anthropologist* 8(2):118–141.
- Fewkes, J. W. 1897. Tusayan Snake Ceremonies. Pages 267–311, plates 267–311 in *16th Annual Report, Bureau American Ethnology*, Washington DC.
- Fewkes, J. W. 1898. Hopi Snake Washing. *American Anthropologist* 11(10):313–318.
- Fewkes, J. W. 1902. Tusayan flute and snake ceremonies. Pp. 957–1011 In: *Nineteenth annual report of the Bureau of American Ethnology*, 1897–1898. U.S. Gov. Printing Office, Washington, DC
- Goodman J. 2005. *Tobacco in history: The Cultures of dependence*. Routledge 277 pp.
- Henningfield, J. E., R. V. Fant, A. Radzius, and S. Frost. 1999. Nicotine concentration, smoke pH and whole tobacco aqueous pH of some cigar brands and types popular in the United States. *Nicotine & Tobacco Research*, 1:163–168.
- Hough W. 1898. Environmental interrelations in Arizona. *American Anthropologist* 11(5):133–55.
- Hovens, P., W. J. Orr, and L. A. Hieb, eds. 2004. *Travels and Researches in Native North America, 1882–1883. Herman ten Kate*. University of New Mexico Press, Albuquerque, New Mexico. xi, 411 p.
- Kishbaugh, A. L. 2017. *Deep Waters: Frank Waters Remembered in Letters and Commentary*. University of New Mexico Press, Albuquerque. 400 p.
- Klauber, L. M. 1930. New and renamed subspecies of *Crotalus confluentus* Say, with remarks on related species. *Transactions of the San Diego Society of Natural History* 6:95–144.
- Klauber, L. M. 1931. Field notes. August.
- Klauber, L. M. 1932. A herpetological review of the Hopi snake dance. *Bulletins of the Zoological Society of San Diego*. 9:1–93.
- Klauber, L. M. 1935. A new subspecies of *Crotalus confluentus*, the prairie rattlesnake. *Transactions of the San Diego Society of Natural History* VIII:75–90.
- Klauber, L. M. 1936. Key to the rattlesnakes with a summary of characteristics. *Transactions of the San Diego Society of Natural History* VIII:185–276.
- Klauber, L. M. 1956. *Rattlesnakes. Their Habits, Life Histories, and Influence on Mankind*. 2 Vols. University of California Press, Berkeley and Los Angeles, California.
- Klauber, L. M. 1972. *Rattlesnakes. Their Habits, Life Histories, and Influence on Mankind*. (2nd Edition) 2 Vols. University of California Press, Berkeley and Los Angeles, California.
- Lawler, T. S., S. B. Stanfill, R. B. DeCastro, J. G. Lisko, B. W. Duncan, P. Richter, and C. H. Watson. 2017. Surveillance of nicotine and pH in cigarette and cigar filler. *Tobacco Regulatory Science* 3(2):101–116.
- Lyon, L. 1982. John Gregory Bourke. *A Cronnica de Nuevo Mexico* 14:2–6.
- Malotki, E. and K. Gary. 2006. *Hopi Stories of Witchcraft, Shamanism, and Magic*. University of Nebraska Press, lvii +290 pp.
- Mateer, W. R. 1879. In *Masterkey* 8(4):150–155. (not seen, fide Udall, 1992). Presumably, the first published reference to Hopi snake ceremonies. See Anonymous 1879.
- Mackessy, S. P. 2010. Evolutionary trends in venom composition in the western rattlesnakes (*Crotalus viridis* sensu lato): toxicity vs. tenderizers. *Toxicon* 55(8):1463–1474.
- Mindeleff, C. 1886. An Indian Snake-dance. *Science* 178:12–13.
- Minton, S. A., and M. R. Minton. 1980. *Venomous reptiles*. Charles Scribner's Sons, New York 308 pp.
- Moerman D. E. 1986. *Medicinal plants of Native America*, Volumes 1 and 2. Technical Report 19. Museum of Anthropology University of Michigan, Ann Arbor. 910 pp.
- Morris, D. and R. Morris. 1965. *Men and Snakes*. McGraw Hill, New York. 224 p.
- Okoli, C.T., T. Kelly, and E. J. Hahn. 2007. Secondhand smoke and nicotine exposure: a brief review. *Addictive Behaviors*, 32(10):1977–1988.
- Parsons, E. C. 1940. A Pre-Spanish Record of Hopi Ceremonies. *American Anthropologist* 42 (3): 541–542.
- Perkins, K. A., L. H. Epstein, J. Grobe, and C. Fonte. 1994. Tobacco abstinence, smoking cues, and the reinforcing value of smoking. *Pharmacology Biochemistry and Behavior* 47(1):107–12.

- Powell, J. W. 1875. The ancient province of Tusayan. *Scribner's Monthly*, XI (2):193–213.
- Protherics. 2000. CroFab™ Package Insert. PLA Reference No. 98–0507 (October 2000). Protherics, Inc. Nashville, TN.
- Pucca, M. B., F. A. Cerni, R. Janke, E. Bermúdez-Méndez, L. Ledsgaard, J. E. Barbosa, and A. H. Laustsen. 2019. History of Envenoming Therapy and Current Perspectives. *Frontiers in Immunology* 10:1–13.
- Rafinesque, C. S. 1818. Farther Account of Discoveries in Natural History, in the Western States, by Constantine Samuel Rafinesque, Esq. communicated in a Letter from that Gentleman to the Editor. *American Monthly Magazine and Critical Review*. IV:39–42.
- Reiserer, R. S. 2016. Art and rattlesnakes. Pages 21–38 in G. Schuett, M. J. Feldner, C. E. Smith, and R. S. Reiserer (Editors). *Rattlesnakes of Arizona, species accounts and natural history*. Vol. 1. Eco Publishing, Rodeo, New Mexico.
- Saviola, A. J., D. Pla, L. Sanz, T. A. Castoe, J. J. Calvete, and S. P. Mackessy. 2015. Comparative venomomics of the Prairie Rattlesnake (*Crotalus viridis viridis*) from Colorado: Identification of a novel pattern of ontogenetic changes in venom composition and assessment of the immunoreactivity of the commercial antivenom CroFab®. *Journal of Proteomics* 121:28–43.
- Sewall, H. 1887. Experiments on the preventive inoculation of rattlesnake venom. *The Journal of Physiology* 8:203–210.
- Stephen, A. M. and H. J. Messinger. 1889. The Snake Dance-Barbaric Religious Festival of the Moqui Indians—"The World's" Expedition Witnesses the Ceremonies-Indian Braves Dance with Writhing Rattlesnakes in Their Teeth-Weird Invocations of the Gods of the Underworld-Shocking Religious Rites in the Wilds of Arizona -The Strange Legend Held Sacred by the Superstitious Moquis. *New York World*, Sunday, September 8, 1889, p. 9, 10 figures.
- Ten Kate, H. 1885. Travels and Researches in Native North America, 1882–1883. Translated and edited by P. Hovens, W. J. Orr, and L. H. Hieb. University of New Mexico Press, Albuquerque.
- Udall, S. R. 1992. The Irresistible Other: Hopi Ritual Drama and Euro-American Audiences. *The Drama Review* 36: 23–43.
- Villiers, A. 1975. *Les serpentes d'ouest Africain*. Institut Français Afrique, Université de Dakar, d'Afrique Noire.
- Voth, H. R. 1903. The Oraibi Summer Snake Ceremony: The Stanley McCormick Hopi Expedition. *Publications of the Field Columbian Museum. Anthropological Series* 3:267–358.
- Waters, F. 1977. Book of the Hopi. Penguin Books, New York. 345 pp.
- Weir, B. 2020. Discover Arizona: Northeastern Arizona: Hopi Country [Accessed 12 April 2021].
- Whiting, A. F. 1939. Ethnobotany of the Hopi. *Museum of Northern Arizona Bulletin* (15):31, 89.
- Whiteley, P. M. 1988. *Deliberate acts, changing the Hopi culture through the Oraibi split*. University of Arizona Press, Tucson.
- Winter, J. C. 2000. Traditional uses of tobacco by Native Americans. Pages 9–58 in Winter (ed.) *Tobacco use by Native Americans. Sacred smoke and silent killer*. University of Oklahoma Press, Norman.
- Wright, B. 2008. Hopi Kachinas: A Life Force. Pages 111–121 in Glenn et al. (eds) *Hopi Nation: Essays on Indigenous Art, Culture, History, and Law*. University of Nebraska, Lincoln.
- Yarrow, H. C. 1888a. Reptiles, poisonous. Pages 164–174, Volume 6 in A. Buck (ed) *Reference Handbook of the Medical Science*. William Wood & Co., New York.
- Yarrow, H. C. 1888b. Snakebite and its antidote: experiments with *Crotalus* venom and reputed antidotes with notes on the saliva of *Heloderma* ("Gila monster"). *Forest and Stream* 30:307, 327, 349, 369, 412, 431.

We suggest the following format for citing this article:

Murphy, J. C. and Michael D. Cardwell 2021. Avoiding Envenomation While Dancing with Rattlesnakes, the Hopi Snake Ritual and Tobacco. *Bibliotheca Herpetologica* 15(6):46–60.



On the Discovery and Scientific Description of the Emerald Tree Monitor, *Varanus prasinus* (Schlegel, 1839)

Hans J. Jacobs¹ and André Koch²

¹Siekenweg 8, D-33178 Borcheln, Germany, hjjacobs@gmx.de

²Zoologisches Forschungsmuseum Alexander Koenig & Leibniz Institute for Animal Biodiversity, Section of Herpetology, Adenauerallee 160, D-53113 Bonn, Germany, andreascalkoch@web.de

Abstract. We have researched the history of the type description and holotype of the Emerald Tree Monitor. Our investigation revealed four important details: These are 1) the collecting situation of the first *Varanus prasinus* specimen in New Guinea in July or August 1828; 2) its first pictorial representation created there in the field, a watercolour by Pieter van Oort, that is published here for the first time (and which was recently made available online by the Naturalis museum in Leiden); 3) the engravings in connection with Hermann Schlegel's scientific descriptions of the species in three separate, but connected publications in 1839, 1841, and 1845; and 4) the descriptions (in part jointly published with Salomon Müller), connected with these and being, together with the naming, the actual, overarching scientific goal. Schlegel's first description in 1839 was preceded by John Edward Gray's (1831a) reference to the "Green Monitor", *Monitor viridis*, a "nomen dubium" according to Mertens (1963), aspects, that led to a, so far, inadequately clarified nomenclatorial situation around this name. Because the later holotype of *Monitor prasinus* had doubtlessly not yet arrived in Leiden at the time of Gray's visits to this museum collection, it remains unclear which specimen Gray referred to. In order to shed light on this open question, we provide a new perspective on the events of this historical context. In addition, Müller's handwritten descriptive note about *V. prasinus*, dated August 1828 and probably produced in New Guinea briefly after having caught the later holotype, has been discovered in the archives of Naturalis and is presented here also for the first time in printed form. Müller's knowledge about the morphology of monitor lizards becomes obvious not only in his abundant notes and descriptions — besides an astonishing number of snake, gecko, agamid, and skink species — but especially in the joint description of *Monitor prasinus* together with Schlegel in 1845. In addition, we clarify the correct publication date of Schlegel's original description of *M. prasinus* in his treatises called "Abbildungen neuer oder unvollständig bekannter Amphibien, nach der Natur oder dem Leben entworfen und mit einem erläuternden Texte begleitet", which were issued in five parts between 1837 and 1844. This is also relevant for other reptile and amphibian species that were named for the first time in this work.

Key words: Natuurkundige Commissie, Dutch East Indies, New Guinea, Hermann Schlegel, Salomon Müller, John Edward Gray, Pieter van Oort.

VARANUS PRASINUS AND THE DUTCH NATUURKUNDIGE COMMISSIE (1820–1850)

Often in the field of taxonomy and species discoveries, initial descriptions are framed with a good deal of adventure, mystery, and even puzzles. The case of the Emerald Tree Monitor (*Varanus prasinus*) (Fig. 1) from New Guinea is no exception. The problems and questions connected with the early history of this species are manifold. Was Hermann Schlegel (1804–1884) really the first person to scientifically describe the species? Is 1839 actually the correct date for his publication? And what was the reason for Mertens (1963) not accepting Gray's earlier (1831a) description of *Monitor viridis*, which could theoretically have nomenclatorial priority?

For the discovery and scientific description of the biodiversity of those tropical islands which are now known as Indonesia, the Netherlands and its Natuurkundige Commissie voor Nederlands-Indië (= Natural history commission for the Dutch Indies), founded by King William I in 1820 (and

terminated in 1850), played a major role (Sirks 1915, Weber 2019, van Wingerden 2020). In the same year Heinrich Kuhl (1797–1821), Gerrit Laurens Keultjes (1786–1821), and Johan Coenraad van Hasselt (1797–1823) left for Java, the centre of the Dutch colony in Southeast Asia. The fate of most members of the Natuurkundige Commissie, however, is tragic. Kuhl and Keultjes died within three days of each other only nine months after their arrival on the island. In 1826 the zoologists Salomon Müller (1804–1864), Heinrich Boie (1794–1827), Heinrich Christian Macklot (1799–1832) and the draughtsman Pieter van Oort (1804–1834) reached Java on a second mission. Of the first two teams, that were sent from Europe to Asia, only Müller succeeded in returning home. Out of 18 members of the Commissie 12 died in the East Indies.

Heinrich Christian Macklot, Salomon Müller, Heinrich Boie, Pieter van Oort, and Gerrit van Raalten (1797–1829) were assigned to join the second Dutch mission as zoologists, taxidermists and draftsmen, who, coming from Ambon,



Fig. 1. Adult specimen of *Varanus prasinus* from the Vogelkop-Peninsula. Please compare with the holotype (Fig. 2) from the same distribution area. Photo: Hans J. Jacobs.

arrived in the Lobo region of New Guinea on July 4th 1828 with two ships, the corvette *Triton* and the accompanying schooner *Iris* (Huizinga 2004). There they collected the first specimen of *V. prasinus* shortly afterwards. Despite the tragic fate of most members of the Commissie they succeeded in discovering a large number of unknown species not only of reptiles, but also birds, mammals, and fishes as well as plants. Although a lot of their material was lost, an unbelievable quantity reached Europe and was archived at the Rijks-herbarium and the Rijksmuseum van Natuurlijke Historie in Leiden, renamed as Naturalis Biodiversity Center in 1988.

JOHN EDWARD GRAY'S (1831A) BRIEF AND DUBIOUS DESCRIPTION OF *MONITOR VIRIDIS*

John Edward Gray (1800–1875), the long-time keeper of zoology of the British Museum (Natural History) in London, was the first to publish a, however meagre, description of a tree monitor lizard, the “Green monitor”, *Monitor viridis* (Gray 1831a). In order to be able to identify the voucher specimen that can be considered as the object of Gray’s examination, it is essential to answer the question when he carried out his tour of the natural history museums of continental Europe. His tour was by no means a single trip, as the difficulties and hardships of traveling at the beginning of the 19th century would have suggested, and it appears Gray regularly set off to the most important European museums.¹ Evidently, his marriage in 1826 enabled him to travel freely². He most probably came across the first *V. prasinus* specimen between 1826 and the summer of 1830.

Insofar as cataloguing had only been carried out systematically in Leiden since around 1860 (M. Hoogmoed, pers. comm.), it will be difficult to identify the individual specimen to which the following brief description by Gray (1831a: 26) refers: “Nostrils medial, scales large, yellow, with large dark spots, Mus[eum]. Leyd[en = Leiden].” Although his description may indeed be quite sparse, in the early days of biodiversity exploration this was no exception since scientific descriptions were usually extremely short and frequently embellished and specified over the following years, often by other authors. Nonetheless, three peculiarities must be pointed out: Gray (1831a) names the new monitor lizard “Green Monitor”, but adds “yellow” as the background colouration; the phrase “scales large” must also be surprising, especially with regard to tree monitors, which exhibit rather small body scales (see Bucklitsch et al. 2016), and as well the reference to the colour pattern consisting of “large dark spots”, although the Emerald Tree Monitor shows a dorsal pattern of black chevrons.

That it was actually this species, Gray (1831a) referred to, which is today known as *Varanus prasinus*, has to be disputed in this context, as has been done previously by Mertens

¹“On his annual leaves he used to visit museums on the Continent, mainly in search of zoological specimens. (...) In the next five years he visited Leyden, Frankfurt, Hamburg, Berlin, Darmstadt and Stuttgart” (Gunther 1980a: 69–70).

²“Dr. Gray had made it a rule to spend the greater part of his annual vacations visiting the different continental museums to make himself acquainted with the manner in which they are conducted and arranged, how named and catalogued, and to meet the different dealers residing on the Continent” (Gunther 1980b: 222).

(1963). There is actually no other monitor lizard species exhibiting a predominantly green or yellow colouration with dark markings, except for *V. reisingeri* from Mis(o)ol Island, which was described only recently by Eidenmüller and Wicker (2005). Neither colour nor pattern nor the indication of scale size necessarily point to a tree monitor lizard. It must be taken into regard, though, that the colour green can change to cyan or blue in preservative, which might indicate Gray's specimen was probably not green in life.

But most probably this was not the reason why Mertens (1963) classified Gray's (1831a) taxon as "nomen dubium", a doubtful name. The exact reasons for his decision are unknown, since he provided no indication. He cannot have missed a clearly identifiable type specimen since RMNH 4812 was available at the Leiden collection, so initially, Mertens (1942) was probably irritated by Gray's (1831a) omission of the terra typica (as is evident from his listing the name *Monitor viridis* with a leading question mark under the synonymy of *V. prasinus*), both together being integral requirements of a proper species description (ICZN 1999).

A comparison with two other monitor species described by Gray (1831a) in the same work may shed some further light on this question: *Monitor timorensis* and *Monitor nebulosus*, which he had discovered and examined in the Muséum National d'Histoire Naturelle in Paris. In both cases he indicated the terra typica, Timor and Java, respectively. So, quite obviously it must have been the lack of a type locality as an indispensable information that prompted Mertens (1963) to eventually label the taxon *viridis* as "nomen dubium". However, it goes without saying that it was not Gray (1831a) who investigated the origin of the monitor lizard specimens that served as types. One can legitimately assume that a tag was attached to the respective voucher specimens, identifying their collectors (*V. timorensis*: Péron und Lesueur; *V. nebulosus*: Leschenault) and origins. This was obviously not the case with *Monitor viridis* at the Leiden collection.

This lack of information, which Mertens (1959: 226; 1963: 14) mentioned whenever he referred to Gray's (1831a) description, must have referred to the distribution area alone. For Mertens it was not discernible in his time that — as we have explained above — it could not be proven which specimen Gray's (1831a) description is based on. He could not help but assume that RMNH 4812 was the type specimen of *Monitor viridis* Gray, 1831.

Gray (1831a), on the other hand, had not intended his short lines referring to the three new monitor lizard species as definite descriptions. In a footnote to the section containing, among others, the monitor lizards (genus *Monitor*) he modestly declared them as "only an attempt at noting the species which I have seen named in collections" he visited (Gray 1831a: 25). This means that these new species had already been recognized and given names in the respective museum collections, but which had not yet been officially published. These so-called "shelf names" (= nomina nuda), however, have no taxonomic relevance. Nevertheless, they

were important for the internal organization of the museum collections; and evidently, they were also held in some esteem. Gray (1831b: vii) himself pointed out that "(...) Herr Temminck requested I would indicate in what Museum I had seen it [= the specimen], and the name under which it was there described (...)."

By using these "shelf names" in combination with a short characterization, however, Gray (1831a) made them nomenclatorially available under the Zoological Code, even if this was not his intention, as cited above. Therefore, his descriptions of *Monitor timorensis* and *Monitor nebulosus* (Gray 1831a) are still accepted as valid today (e.g., Auliya and Koch 2020).

The "shelf name" *viridis*, though preserved for posterity through Gray (1831a), in itself proves that there must have been another specimen before the holotype of *Varanus prasinus* (Fig. 2). The first, and still unknown name-bearing voucher specimen served as basis for Gray's (1831a) *Monitor viridis*, whereas the later name assigned to the holotype of *Monitor prasinus* most certainly originated from Müller's (1828) handwritten notes from New Guinea.

If Gray's description of 1831 raises doubts, at least with regard to colour and pattern, whether it actually refers to *V. prasinus*, the description of 1845 clearly stands, due to the influence of Müller's and Schlegel's (1845) and Schlegel's (1837–1844) publications, which are mentioned *expressis verbis* as references when he wrote: "Green, with narrow dark cross-bands, generally placed in pairs, those of the neck lunate, the rest transverse (...)" (Gray 1845: 13). This characterisation doubtlessly evokes the Emerald Tree Monitor (*V. prasinus*).

THE NAME-BEARING VOUCHER SPECIMEN(S)

The question which specimen was the object and basis of Gray's (1831a) description of *Monitor viridis* remains mysterious. There is no doubt that Hermann Schlegel, the curator at the time, had access to specimen RMNH 4812 at the "Rijksmuseum van natuurlijke Historie" in Leiden (Fig. 2). Brandenburg (1983: 38) assumed that both descriptions refer to the same voucher specimen, arguing that this was the only one in the museum collection in 1839 and that this was probably also the case at least nine years earlier, when Gray visited Leiden. Here, however — as we shall see below — Brandenburg (1983) is demonstrably wrong. Sprackland (1991) claimed that Gray's specimen was lost. If that were the case, the monitor specimen should have been lost before Schlegel started to work on his own description, otherwise he would have certainly referred to it. Wherever it originated from, whoever collected it, natural history professionals or simple sailors, this specimen must have disappeared very soon after Gray's visit to Leiden, unless we have to assume that there was a mix-up, and some other — maybe juvenile — lizard species such as a tegu was erroneously taken for a (tree) monitor. At that time, no taxonomic distinction was made between tegus and moni-



Fig. 2. The preserved holotype specimen (RMNH 4812) of *Monitor* (= *Varanus*) *prasinus* Schlegel, 1839, that served as template for van Oort's watercolour painting (see Fig. 5). Photo: André Koch.

tor lizards. This would also agree with one feature mentioned by Gray (1831a), the large (head) scales. Gray visited the museum of natural history in Leiden definitively before October 1830, the date that he added to his acknowledgements in the "Animal Kingdom", which was published as an entire book in 1831. But since the publication of a reprint (see foreword by Ulber in Gray 1996: i), we can be more precise. As was common with similar books at the time, the first part was published in September 1830, while Gray's appendix was issued certainly not later than March 1831.

At that time the future holotype had already been caught near Fort du Bus in July or August 1828 (Müller 1828). The circumstances of collecting the voucher specimen were soberly described by Müller and Schlegel (1845: 44) as follows: "Het werd door een' onzer matrozen in het bosch met een' stock gedood" (= It was killed by one of our sailors with a stick in the woods). The name of the sailor responsible has not been passed down. In his place, Müller and Macklot are generally considered as collectors, as for instance in the Naturalis inventory (Fig. 3) and the label of the holotype jar, while Naturalis' shipment lists as well as van Oort's watercolour painting (Fig. 5) point to Salomon Müller alone. Whoever caught it, doubtlessly this specimen cannot have arrived in Leiden early enough for Gray to examine and describe it.

This was only to take place through a shipment that was sent by the members of the Natuurkundige Commissie from

Buitenzorg, today's Bogor on Java, to Holland in February 1831. Seven months later, in September, its receipt in Leiden was acknowledged directly under the mailing lists by Hermann Schlegel, who had worked as assistant to Coenraad Jacob Temminck (1778–1858), the first director of the Rijksmuseum van Natuurlijke Historie, since 1825. The fact that precisely with this delivery from Java also drawings were sent back home, including the first depiction of a *Varanus prasinus* by Pieter van Oort (Fig. 5), is not entirely irrelevant. In lists of a shipment from the previous year, likewise sent in February 1831 and also acknowledged by Schlegel in September as having arrived "in goede staat" (= in good condition) according to the handwritten entry catalogue at Naturalis³, there is no mention of an Emerald Tree Monitor. Accordingly, it can be ruled out that Gray saw the *prasinus* holotype, which reached Leiden only in the fall of 1831. Consequently, there must have been another voucher specimen in the museum, that Gray examined during his visit(s). However, the question when and by whom this specimen was captured and dispatched to Leiden remains completely puzzling since Gray (1831a) provided no further informa-

³nco_NNM001001435_001 in Gassó, E., Stork, L., Weber, A. et al. ed., *Natuurkundige Commissie Archives Online*. Leiden: Brill 2020. Naturalis Biodiversity Center Leiden; The Netherlands. Available at: https://dh.brill.com/nco/view/nco_NNM001001435_001/making-sense

tion. Shipments from the first commissioners Kuhl, van Hasselt, and van Raalten, which arrived in Leiden in July 1824, December 1825 (Klaver 2007: 25) and, mainly the botanical material, in 1826 (Hildenhagen 2013: 184), hardly come into consideration. In any case, there is no entry for a tree monitor lizard in the museum's entry and inventory lists.

Schlegel's (1839) first description gives "West-Küste Neu-Guinea's" (= West coast of New Guinea) as the origin of the holotype, thus satisfying the need to provide a *terra typica*, although not even literally fixed in the Code (ICZN 1999), and is therefore more elaborate than Gray's (1831a) account nine years earlier: Schlegel (1839: 78–79) distinguished his new species from the other monitor lizards by having "(...) ungemein zarte und schlanke Formen, (...) schöne grüne Farbe, die nur oben durch schwarze winkelförmige Figuren unterbrochen wird. Füße sehr langgestreckt. Schwanz ungemein lang, wenig zusammengedrückt" (= (...) extremely delicate and slim shapes, (...) beautiful green colour, which is only interrupted at the top by black angular figures. Feet very long. Tail extremely long, slightly compressed"). No doubt this is decisively more reminiscent of a tree monitor than Gray's (1831a) earlier description.

Besides, it is remarkable that Schlegel (1839: 67) already declares that it would be necessary to establish "eigne Geschlechter" (= own genera) for *V. prasinus* and other monitor species which, in fact, was put into practice only in 2016 with the splitting of the subgenus *Euprepiosaurus* and the introduction of the new subgenus *Hapturosaurus* for the tree monitors (Bucklitsch et al. 2016).

THE COLLECTING CIRCUMSTANCES IN THE DUTCH EAST INDIES

The holotype of Schlegel's (1839) description, an adult male, was caught near Triton Bay on the southwest coast of New Guinea in July or August 1828. Neither the handwritten inventory list at the Naturalis museum (Fig. 3), which is evidently not chronological and calls the specimen "(Monitor) *Varanus prasinus*", nor the more recent, typewritten label on the glass cylinder in which the holotype is preserved, give the exact place and year, but name "S[alomon]. Müller" and "H[einrich]. Macklot" as collectors (but see above).

Schlegel's (1839: 79) statement of the *terra typica* of *Monitor prasinus* in his first description of the Emerald Tree Monitor is not particularly precise: "Kommt von der West-Küste Neu-Guinea's" (= comes from the West Coast of New Guinea). It was not until six years later (see Müller and Schlegel 1845: 44), that the precise location "Fort du Bus, in de baai Oeroe-Langoeroe" (= Fort du Bus, in the Uru-Languru Bay) followed, most certainly contributed by his co-author Salomon Müller.

The whole undertaking of the Dutch government was by no means a purely scientific expedition. It was rather a politi-

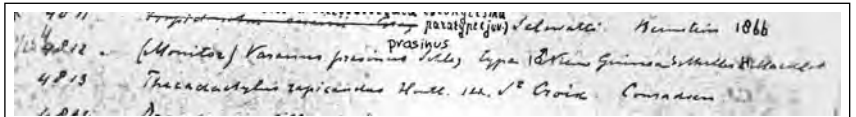


Fig. 3. Excerpt of a page from the Naturalis inventory with the holotype of *Varanus prasinus* listed under entrance number 4812. Photo by courtesy of Naturalis Biodiversity Centre.

cally motivated mission, the aim of which was to sound out a strategically advantageous location for a Dutch naval station (Mees 1994: 5). The main focus was on lucrative trade routes, especially for expensive spices from the Moluccas, the Spice Islands, but also geostrategic markings in competition with the British Empire. A new historical study even suggested that "the presence of these scientists [on board the *Triton*] was meant to serve as a cover-up" in order not to draw attention to the military aims of the venture and construction of the fort (Rouschop 2020).

This location was later appropriately named Fort du Bus after the Belgian Leonard Pierre Joseph Vicomte de Bus de Gisignies (1780–1849), Governor General of the Dutch East Indies between 1826 and 1830. As was undoubtedly common in military conquests, the conquerors immediately exchanged the traditional local names to put their stamp on everything they took over: The corvette *Triton*, for example, gave the bay its name, which was previously called Uru Languru in the vernacular of the local natives (Wichmann 1910: 9). Appropriately, the annexed place Merkusoord was named after Pieter Merkus (1787–1844), the Dutch governor of the Moluccas at the time, who had honoured the crew of the *Triton* with a ball when they left Ambon (Müller 1857: 44–45). The entire landscape was called Lobo as we find it on van Oort's drawings and in Müller's notes (Wichmann, 1910: 10). Naming suggests an act of seizing power over the named — not only in political or territorial, but also in genealogical and taxonomical contexts.

After no more than eight weeks, during which they even had to help erecting picket fences, the civilians and scientists left Triton Bay again at the end of August 1828 for Timor via the important trading post on Ambon. In this short period, commission members collected a huge number of animals and plants, most of which were completely unknown in Europe: A total of 341 bird skins, 34 skeletons, and 12 eggs were collected alone during this voyage according to Macklot (as cited in Mees 1994: 14), whereas Mörzner Bruyns (2018: 98–99) claims that "119 bird species were collected, and Zippelius gathered a collection of 429 botanical specimens". It is obvious, not only with regard to the reported figures, that one of the main interests of the natural scientists involved was in the avifauna of New Guinea.

Together with the botanist Pieter Willem Korthals (1807–1892), Salomon Müller was the only survivor of the Naturkundige Commissie who returned to Europe in 1837 with the natural historical material of the entire group of natural scientists (van Wingerden 2020). The Dutch fort did not have a favourable fate either. In 1835, after barely eight years, it

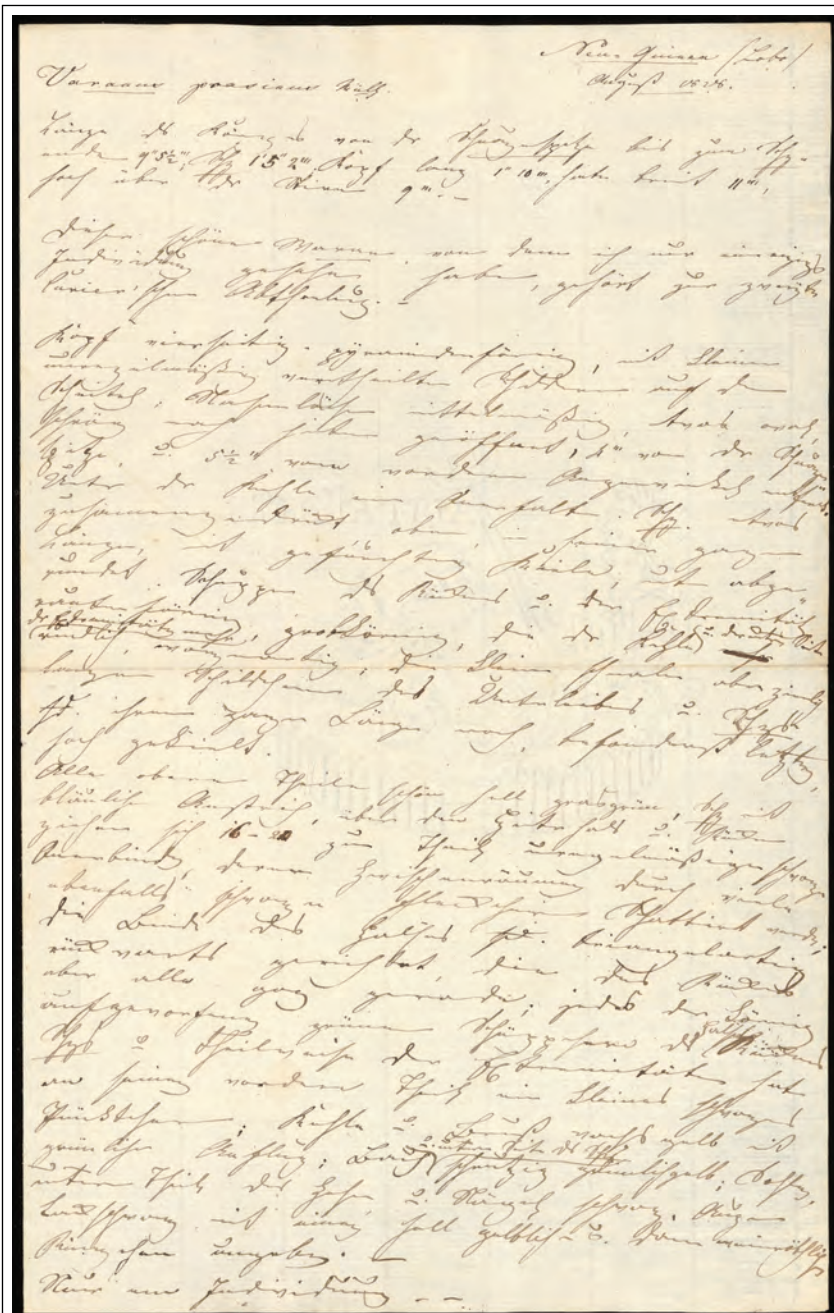


Fig. 4. Unpublished description of the first caught specimen of *V. prasinus* by Salomon Müller. For an English translation, please refer to the text. (Available at: https://dh.brill.com/nco/view/nco_NNM001001113_127/makingsense)

was abandoned as a consequence of too many deaths due to tropical diseases among the soldiers.

The botanical garden in Buitenzorg, today's Bogor, in the immediate vicinity of Batavia (later called Hollandia and now known as Jakarta), the commercial centre of the Dutch East India Company in Southeast Asia, served as headquarters for the natural history commission. There, "...the colonial government had reserved a house and store rooms" (Weber 2019), which, at least in part, are still present today (A. Koch, pers. observ.). Not only were finds and voucher material from the individual

field trips temporarily stored there, "in February 1821 the garden's facilities were used to dissect and describe the anatomy of a female elephant (*Elephas indicus* [= *Elephas maximus*])"⁴, that, by the way, reappeared together with a *Rhinoceros javanicus* (= *Rhinoceros sondaicus*), a Javan rhinoceros, on the very first transport lists to Leiden dating from December 1822⁵. The freight lists from September 1831 record under numbers XI. and XII. containers with fish in alcohol from „Heer Burger van Japan gezonden" (= Mr. Burger sent from Japan)⁶, which demonstrate that Buitenzorg was also used as a destination for mailings from other parts of Asia. The various boxes on the freight lists are labelled, for example "Squeletta van Java" (= Skeletons from Java), "Vogels van Nieuw Guinea" (= birds from New Guinea), "Mammalia van Timor" (= mammals from Timor), "Van Poeloe Samao and Java" (= from the island of Samao [= a little islet west of Timor] and Java), and so on, so that the compilation does not allow any conclusions to be drawn about the precise collection date of the respective material. Therefore, for instance, it is conceivable that specimens collected by Kuhl and van Hasselt between 1820 and 1823 could also have been in the containers labelled "Java".

Even if no shipment of animals that may have contained Gray's specimen was known before the landing of the second group of the Natuurkundige Commissie on New Guinea in July 1828, at least the potentiality should be considered that voucher specimens could have reached Batavia or Buitenzorg or even Europe by unofficial channels. In this regard, Albertus Seba, an Amsterdam based apothecary and famous collector of natural history items, impressively demonstrated in his spectacular "Thesaurus" almost a century earlier, what could be assembled without an expedition of your own (Seba 1734–1765). Consequently, in many cases we cannot be sure where certain specimens in the Naturalis collection originated.

⁴nco_NNM001001033_001 in Gassó, E., Stork, L., Weber, A. et al. ed., Natuurkundige Commissie Archives Online. Leiden: Brill 2020. Naturalis Biodiversity Center Leiden; The Netherlands. Available at: https://dh.brill.com/nco/view/nco_NNM001001033_001/makingsense

⁵nco_NNM001001188_010 in Gassó, E., Stork, L., Weber, A. et al. ed., Natuurkundige Commissie Archives Online. Leiden: Brill 2020. Naturalis Biodiversity Center Leiden; The Netherlands. Available at: https://dh.brill.com/nco/view/nco_NNM001001188_010/makingsense

⁶nco_NNM001001113_127 in Gassó, E., Stork, L., Weber, A. et al. ed., Natuurkundige Commissie Archives Online. Leiden: Brill 2020. Naturalis Biodiversity Center Leiden; The Netherlands.



Fig. 5. Unpublished draft sketch of the holotype of *V. prasinus* by Pieter van Oort from the archives of the Naturalis museum at Leiden. For a transliteration and translation of the pencil writings see the text. It is available online at: https://dh.brill.com/nco/view/nco_NNM001000670/makingsense

SALOMON MÜLLER'S (1828) HANDWRITTEN DESCRIPTION OF *VARANUS PRASINUS*

As much as the Buitenzorg Botanical Garden may have served as a collection point and central warehouse for the Natuurkundige Commissie, so that in some cases we cannot be sure where certain specimens came from, it was always outstanding scientists who led the respective research teams and who were primarily responsible for the success of the single missions. This undoubtedly applied to Heinrich Kuhl for the first group, and after Heinrich Boie's death in September 1827, Salomon Müller grew more and more into the role of a leader in the second group. His achievements and importance for the success of the Commission can hardly be overestimated. He was never enrolled in a university, but he increasingly developed into a competent zoologist, as the high quality and quantity of his previously unpublished, handwritten notes impressively prove. This and other archival material of the Natuurkundige Commissie was recently made publicly available (Gassó et al. 2020). When Müller managed to return to the Netherlands in 1837, the ornithological part of the Commission's collection alone amounted to 6,500 bird skins, 700 skeletons, 150 nests and 400 eggs, as well as an almost unmanageable number of mammals, reptiles, amphibians, and fishes apart from the myriad of plants, insects, and minerals (Gebhardt 1964).

Among Müller's hitherto unpublished records is the first detailed description of *Varanus prasinus*, which is dated August 1828 and specifies the location with "New Guinea

(Lobo)" (Fig. 4). Obviously, these notes were made shortly or immediately after the voucher specimen was caught — probably not only in the direct temporal, but also situational context with the creation of the watercolour by Pieter van Oort (Fig. 5). His detailed notes undoubtedly refer to the later holotype (Fig. 2) which is still kept at Naturalis in Leiden. We refrain from transcribing the handwritten German text, but below an English translation is provided. A scan of the handwritten original can be viewed online at https://dh.brill.com/nco/view/nco_NNM001001113_127/makingsense.

New Guinea (Lobo)
August 1828.

Varanus prasinus Müll[er].

Length of body from the tip of the snout to the end of the tail 9"5 ½" [25.6 cm]; tail 1'5"2" [46.5 cm]. Head length 1"10" [4.9 cm], width 11" [2.4 cm], height at the brow 9" [2.0 cm].⁷ –

This beautiful monitor lizard, of which I only have seen one individual belongs to Cuvier's second division. –

⁷The usual measures of length at that time differed quite a lot from country to country. In the Netherlands there was a tendency to use the French units of measurements: foot (in French: pied), inch (pouce) and line (ligne), which were indicated with one, two and three apostrophes (i.e., 1 pied = 32.5 cm; 1 pouce = 2.71 cm; 1 ligne = 2.26 mm).

Head four-sided and pyramidal, with small irregularly distributed scales on the crest, nostrils medium, somewhat oval, open at an angle to the rear, located 4^{'''} [0.9 cm] from the tip of the snout and 5 ½^{'''} [1.2 cm] from the front edge of the eye.

A cross fold under the throat. Tail somewhat compressed, above in its entire length with a furrowed keel, rounded below. Scales of the back and the extremities rhomb-shaped, coarsely grained, those of the throat and the underside of the extremities more rounded, cheek-like; the small, narrow, longish scales of the abdomen and tail are in their entire length, especially the latter, highly keeled.

All upper parts nicely light grass-green, tail with a bluish hue, 16–20 partly irregular black crossbands across the end of the neck and body, the spaces in between are also shaded by many black spots; the stripes of the neck are triangular, directed backwards, those of the back are all straight. Each of the grainy raised green little scales of the neck, back, tail or partially of the extremities has on its front part a little black dot. Throat and chest wax yellow with a greenish touch; belly and lower side of the tail dirty greenish-yellow; soles, lower part of the toes, and nails black. Eyes lacquer black surrounded by a light yellowish and then a reddish ring. –

One individual only –

The measurements of the total length and the tail length given by Müller (1828) in feet, inches, and lines correspond perfectly to those provided by Müller and Schlegel's (1845) as long as one operates with the French instead of English units (i.e., 1 pied = 32.5 cm; 1 pouce = 2.71 cm; 1 ligne = 2.26 mm). The converted length measurements are added in brackets. Using the French system was highly plausible, since the members of the Commissie for the most part spoke and wrote French very well.

Even before the very precise, though perhaps little noticed description of *V. prasinus* by Müller and Schlegel (1845) because it was written in Dutch, Schlegel (1839: 78) referred to Müller in his short first characterisation of *Varanus dumerilii*, whose holotype (RMNH 3168) is also kept in the Leiden collection, and thus respectfully recognized his colleague's priority as the discoverer of these new species, when he wrote: "Mr. Müller, the discoverer of this and the following species, allowed me to mention these animals, which will shortly be thoroughly described and illustrated." Obviously, a more elaborate version was already planned by joint authorship at this point in time. Whether Müller's (1828) notes were consulted for the joint publication in 1845 cannot be definitely proven. Although single features are described in similar words in both writings, the description style differs significantly in other aspects. For instance, Müller's (1828) precise observation on the tiny pores on the body scales (Bucklitsch et al. 2016) is missing in the publication by Müller and Schlegel (1845). Nevertheless, the latter description has a high level of authority, precisely because of the collector's scientific competence. It is therefore highly plausible that Müller

himself — as insider knowledge, so to speak — included the circumstances of the catch by the Dutch expedition member in their joint description. The close cooperation is more than plausible because Müller worked together with Schlegel on his zoological collections in the Rijksmuseum van Natuurlijke Historie in Leiden until 1850 (Fransen et al. 1997).

PIETER VAN OORT'S UNPUBLISHED WATERCOLOUR OF *VARANUS PRASINUS*

Schlegel's (1839) first description of *Monitor prasinus* gains particular significance since it included the first illustration of the species that was ever published: the monitor's head portrait (Fig. 7). A picture of the complete specimen (Fig. 6) was not to follow until 1841 in Temminck's "Verhandelingen" (= treatises) (1839–1847, see plate 5 therein in No. 4 of the Zoology volume, issued in March 1841), which was published in 29 parts — similar to Schlegel's (1837–1844) "Abbildungen" (= illustrations) — each of which was supposed to contain 10 plates (Husson and Holthuis 1955). To this illustration, which was published without any accompanying text, the much more detailed description referred, which in turn was only published four years later by Müller and Schlegel (1845) in Temminck (1839–1847, included in No. 12 that appeared in June 1845). Reasons for this disrupted publication history are not known for certain. The printer here again was the publisher of Schlegel's (1837–1844) "Abbildungen" A. Arnz & Co with his Lithographical Institute in Leiden (Husson and Holthuis 1955).

If the portrait of 1839 (Fig. 7) was previously thought to be the first of the Emerald Tree Monitor, this, and with it the genesis of the description, must be revised after the discovery of hitherto unpublished illustrations in the archives of Naturalis in Leiden: Pieter van Oort's watercolour (Fig. 5) is the first and only illustration that was made on site for scientific purposes with the freshly dead specimen in hand.

The *V. prasinus* portrait (Fig. 7) was the first to be published, but its genesis dates back to the unpublished watercolour (Fig. 5). Due to the difficult conditions on site the making of engravings simply was not possible for practical and transport-related reasons. The medium of choice accordingly was watercolour and scientists needed basic abilities in drawing. Many were excellent draftsmen, since drawing — besides collecting — was the only documentation option available. Specialists like van Oort achieved a level of precision that makes a drawing or a watercolour appear to be superior even to modern photography, since species-specific characters may be emphasized. They were in no way guided by artistic considerations and accordingly did not aim to achieve an artistic effect on the viewer, but were exclusively committed to objective and detailed reproduction. To achieve this aim, van Oort is known to have taken very specific notes⁸.

⁸"Een zo duidelijk en uitgebreid mogelijke beschrijving" (= A description as clear and comprehensive as possible) (Nieuwendijk 2011).

Under the circumstances, painters on the expeditionary forces often made first sketches on site, knowing well that some time might pass before they would be able to spend enough time on them for a final rendering. Most probably the collected animals were killed right away and properly prepared only afterwards back in the camp. At that time, specimen preservation options were quite limited, so that Temminck (1825) was forced to hand out a brochure in which the available methods were outlined how to prepare the respective animals and plants as realistically as possible for their further journey (Nieuwendijk 2011).

Presumably, the abundance of the animals and plants collected made it necessary to postpone their necessary documentation. It can be assumed that the draftsmen were forced to use the quieter situation on board the ships for their task. In any case, the watercolour of the Emerald Tree Monitor was created during the period between July 1828 and February 1831, although there is a high plausibility that it was drawn by van Oort almost at the same time as Müller (1828) wrote his description, which we will discuss later.

In addition, reference must be made to another aspect that has often been neglected in the previous literature. The members of the Commissie were not only adventurous explorers, but highly talented and motivated scientists. It is amazing how many detailed anatomical drawings were made parallel to the watercolours, depicting the animal in question. It can be assumed here that the draftsmen — especially Pieter van Oort — did not act on their own initiative, but according to the instructions of the scientists. So, a high level of immediate cooperation in the field must be taken for granted.

If one now turns to the inscriptions on the watercolour sheet, one must first note that they obviously come from different hands. The bottom line is of a more conventional nature and corresponds to the usual standards. In the centre the location is provided: “N. Guinea B. Lobo”. The pencil writing is undoubtedly from the person who also compiled the inventory lists for the two shipments in September 1830 and 1831. An analysis of the handwriting shows that it was Salomon Müller who obviously was responsible for the transport and thus listed the contents of the individual transport boxes. All shipment lists, which Salomon Müller called “Catalogus”, after 1826 were written by himself with the exception of the “Lyst der teekeningen van zoogdieren, vogels, reptilien en visschen (...)” (= List of



Fig. 6. Illustration of *Monitor* (= *Varanus*) *prasinus* on table five included in issue number 4 (published 1841) of Temminck's (1839-1847) “Verhandelingen”. For a close-up of the head portrait, we refer to Fig. 7.

drawings of mammals, birds, reptiles and fishes (...)”⁹) written by Pieter van Oort¹⁰ in Buitenzorg on February 1st 1831, so more than two years after having caught the Emerald Tree Monitor.

⁹nco_NNM001001115_001 in Gassó, E., Stork, L., Weber, A. et al. ed., *Natuurkundige Commissie Archives Online*. Leiden: Brill 2020. Naturalis Biodiversity Center Leiden; The Netherlands. Available at: https://dh.brill.com/nco/view/nco_NNM001001115_001/makingsense

¹⁰According to Gassó et al. (2020, see link above) the list was written by Salomon Müller, but a comparison of the handwriting with Müller's (1828) unpublished notes (see Fig. 4) clearly reveals that he was not the author.

Müller, however, was definitely not the author of the inscriptions on the watercolour, which state that the voucher specimen (and its drawing) originated from “N[eu]. Guinea B[ezirk]. Lobo”, i.e., the district surrounding Triton Bay, where the first Dutch settlement was founded on the island and where the only voucher specimen was collected. And neither was it, very surprisingly, the draughtsman himself. In the lower left corner, we find of the same hand “*Var. prasinus* Müll. n. sp.”, which means that Salomon Müller intended to describe the new species, among many others, himself. Taxonomically more exciting, however, is the crossed-out above the species name: “*Tupin[ambis]. viridis* Daudin”. Assignment of monitor lizards to the genus *Tupinambis* Daudin, 1802 was common in the early 19th century (see Daudin 1802, Kuhl 1820). The genus name *Varanus* was only established by Merrem in 1820 to distinguish between South American tegus and monitor lizards generically. After comparing the handwriting, for instance with the “Catalogus reptielen Kuhl & v.Hasselt. Verzonden in April 1826”¹¹, which is even signed by him, we can identify Hermann Schlegel as the author of the information given below in the watercolour. It must be assumed that Salomon Müller was at his side, for example with the precise specification of the collection location. While Schlegel initially wrote Daudin’s (1802) generic name in conjunction with the Latin epithet *viridis*, which directly reminds us of Gray’s (1831a) description, he later corrected himself by adding the younger generic name “*Varanus*” and the Greek epithet “*prasinus*”, so at least on the watercolour (Fig. 5) as well as in the Leiden freight lists. On the other hand, the species name *Tupinambis viridis* was never coined, nor can it be associated with Daudin’s (1802) publication. Perhaps that is why it was crossed out and — probably due to Müller’s initiative — replaced by the name that he proposed and that is still valid today.

From its first published description in 1839 and in the detailed description published six years later, Schlegel hung on to the combination *Monitor prasinus*, which is somewhat surprising considering the generic name *Varanus* had been in use since 1820. Lichtenstein (1818) was the first to use the name *Monitor*. Before that, Linnaeus (1758) spoke of *Lacerta monitor*, a nomen rejectum for *V. bengalensis* and *V. salvator* (ICZN 1959).

In the lower right-hand corner, we find the name of the painter: [Pieter] v[an]. Oort del[ineavit].“ (= has drawn). A comparison with the signature on other sheets shows that it was not the painter himself who immortalized his name there. The handwritten signature turns completely incomprehensible, though, as soon as one observes the obvious misspelling. First the writer intended the name to end clearly with a “d”, but then he corrected the letter with a slash to a “t”. It would not be implausible if the writer had not been acquainted with

the painter and had accordingly misspelled his name at first, when this information was also added in Leiden.

The note in the upper right corner raises additional questions. Obviously, this is meant as an instruction for the engraver or the publisher preparing the final publication. This also makes it plausible that Schlegel wrote his note in German, because as the publisher he addressed was most probably the Arnz publishing house in Düsseldorf, which in fact published the first description with the head study in 1839. Even though not everything can be deciphered with absolute certainty, the meaning of the note seems beyond doubt: „Diese Tafel dient [primarily the word “ist” was overwritten] bloß zum Colorit für Tab[ula]. [gap in the text] bestimmt“ (= This plate is determined [originally only “is” was written] only for the colouration of plate [gap for number, but no indication]. Above this note is crossed out “Tab[ula]. B.” (= plate B) and diagonally in front of it, written in brown ink: “31 B.” with an intended arrow to include this information after the word “Tafel” (= plate) in the sentence below it. So “31B” probably represents the number of this watercolour. However, this information cannot be related to ship transport from 1831 with the container labelling “B.”: “A. Kisten – B. Vaten“ (= chests – barrels)¹².

After all, this provides an indication of the size of the enterprise at the time. According to the unpublished shipment lists at Naturalis 17 boxes and three barrels were shipped in 1830 and 13 boxes in 1831. Veth (1879) even reported 46 boxes that had arrived in Leiden in 1831, the contents of which came mainly from New Guinea and Timor. What remains decisive is that the above-mentioned function of the watercolour drawing is emphasized again. It was meant to serve for the colouring of the engraving (Figs. 4 and 5), which is given considerable importance since it was intended to accompany the first published description. For a detailed description of the depicted specimen see below.

THE PUBLICATION DATES OF SCHLEGEL’S (1837–44) “ABBILDUNGEN...”

The date of publication of a species name is of extraordinary importance with regard to the nomenclatorial priority in biology. In the present case, Schlegel’s “Abbildungen neuer oder unvollständig bekannter Amphibien, nach der Natur oder dem Leben entworfen” (= Illustrations of new or incompletely known amphibians [note, that there was no differentiation between amphibians and reptiles at that time], designed from nature or life and accompanied by an explanatory text) were published in five parts, so-called decades, because they each included ten plates with accompanying text, between 1837 and 1844. In the past, several authors have investigated the exact dates of publication of these five parts (e.g., Stejneger

¹¹ nco_NNM001001048_001 in Gasso, E., Stork, L., Weber, A. et al. ed., *Natuurkundige Commissie Archives Online*. Leiden: Brill 2020. Naturalis Biodiversity Center Leiden; The Netherlands. Available at: https://dh.brill.com/nco/view/nco_NNM001001048_001/makingsense

¹² nco_NNM001001435_001 in Gasso, E., Stork, L., Weber, A. et al. ed., *Natuurkundige Commissie Archives Online*. Leiden: Brill 2020. Naturalis Biodiversity Center Leiden; The Netherlands. Available at: https://dh.brill.com/nco/view/nco_NNM001001435_001/makingsense

1907: 540, Sherborn 1922: cxiii), while Engelmann (1846: 422) provided no details, so that until today no sufficient answer has been found. Therefore, we provide the following information and hope to contribute to a better understanding of the publication history of this important work on Indo-Australian herpetology.

According to the “Prospectus” of the multi-part work (dated January 1837), a publication cycle of three months for each of the ten parts was planned by the publishing house, which indicates that at least the first three decades were probably largely prepared, if not more or less ready for publication at that time. The print, however, seems to have been severely delayed — possibly for financial reasons as is obvious from the fact that only half the number of the intended parts were finally published, although Gersdorf (1840: 54) mentioned in the review of the second decade that “the price is relatively cheap”. This was certainly not due to a limited availability of drawings, since the Naturalis archives hold a huge amount of still unpublished illustrations and documents from the members of the Natuurkundige Commissie, which was recently made publicly available at <https://dh.brill.com/nco/>. Schlegel’s (1837–1844) whole work, as it was common practise, was offered for subscription and therefore published in separate parts, so that Schlegel (1840: 65) at the beginning of the third decade could declare in a footnote that he had received Gray’s (1838) work on monitor lizards including new taxa when decade three was about to be printed. This enabled him to include Gray’s *Monitor Gouldii* (= *Varanus gouldii*) and suppress the name he had intended for this undescribed monitor lizard species.

Unfortunately, the individual decades were not printed and published with complete title pages containing the date or at least the year of publication, so that secondary sources have to be used to clarify the exact publication history. The “Allgemeine Bibliographie für Deutschland” (= General Bibliography for Germany), published between 1836 and 1892, turned out to be a treasure trove for our purpose. Within this chronological bibliography the third decade of Schlegel’s work was reviewed in volume 4, issue 34, published on August 23, 1839. It must be added, though, that this indirect line of argumentation cannot determine the exact date of publication itself. It can merely identify a date before which the work in question necessarily has to have been published. The second decade was published before May 1839; the publication reference can only be found in vol. 2, so that its review appeared just three months before the one of the third part.

Since the precise publication date could of course also be relevant for further first descriptions in the “Abbildungen neuer oder unvollständig bekannter Amphibien”, we briefly give the year of publication according to the “Allgemeine Bibliographie für Deutschland”, in which the respective decades were reviewed:

1st decade – (No. 19) vol. 2, no. 2019, (1837: 256);

2nd decade – (No. 19) vol. 4, no. 1884, (1839: 241);

3rd decade – (Nr. 34) vol. 4, no. 3992, (1839: 482);

4th decade – (Nr. 41) vol. 5, no. 5295, (1840: 601).

For the last two decades we have to refer to the “Repertorium der gesammten deutschen Literatur” (= Repertory of the Entire German Literature):

3rd and 4th decades again together also in vol. 26, no. 1486, Gersdorf (1840: 53–54);

5th decade – vol. 5, no. 1695, Gersdorf (1844: 362) and vol. 6, no. 3620, Gersdorf (1844: 216).

Therefore, publication dates of Schlegel’s descriptions of various new species within the third decade need to be corrected to 1839, if necessary. For *Draco sumatranus*, for instance, the year of publication is usually given as 1844 (Musters 1983). For *Varanus tristis* and *Varanus salvator celebensis* the publication years are usually given as 1838 and 1844, respectively (Böhme 2003), while for *Varanus dumerilii* and *Varanus prasinus* the year of publication is usually correctly stated as 1839 (Böhme 2003). In amphibians, the years of publication for *Rhacophorus reinwardtii* (usually given as 1840, see e.g., Frost 2021) and *Rhacophorus margaritifer* (usually given as 1837, see e.g., Frost 2021) need correction.

In the “Prospectus”, the publishing house especially emphasized the “Bearbeitung der Tafeln” and the “getreue Ausführung” (= processing of the plates and their faithful execution). Unfortunately, it has not yet been possible to determine the engraver of the etchings, which were produced separately using four-colour printing. It has to be assumed that the copperplate engravings were planned and prepared well in advance. The structure of the entire volume must have been decided very early during the production process. Unfortunately, it is no longer possible to determine which documents the engraver(s) and colourist(s) had for the “faithful” execution of the pictures.

Schlegel (1839) obviously intended only to provide a first suitable description in combination with the portrait of the Emerald Tree Monitor. He had very probably intended a follow-up soon afterwards in Temminck’s (1839–1847) “Verhandelingen over de natuurlijke Geschiedenis der Nederlandsche Overzeesche Bezittingen” (= Treatises on the Natural History of the Dutch Overseas Possessions), in which the etching of the complete specimen (1841, Fig. 6) was to be included. Unfortunately, for reasons unknown, the much more elaborate description appeared four years later than the corresponding etching (Müller and Schlegel 1845).

The high quality of the sheet is underlined by the names — contrary to the “Abbildungen” — of the responsible persons: “T. C. Bruining, in lap[is]. del[ineavit].” (= drawn in stone; lower left corner), “Arnz. Amsterd[am]. color[avit].” (center), “J. M. Kierdorff, impr[essit].” (= imprinted; lower right corner). Tieleman Cato Bruining (1801–1877) was a drawing master based in Leiden and Jean Matthieu Kierdorff (1803–1882) was one of the first Dutch lithographers to learn from the well-known Johann Alois Senefelder (1771–1834), the inventor of lithography. The Amsterdam branch of the Düsseldorf Arnz publishing house was responsible for the colour-

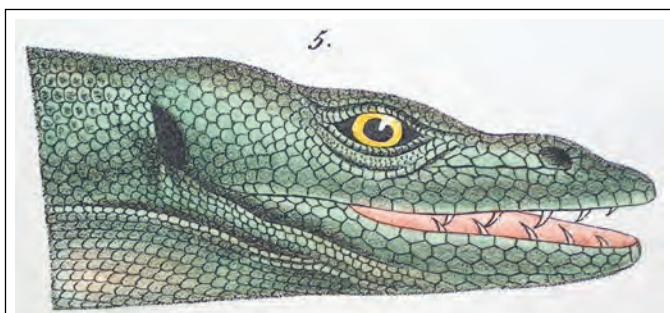


Fig. 7. The first published illustration of *V. prasinus* is this portrait from plate 22, figure 5 accompanying the original species description by Schlegel (1839).



Fig. 9. Mirrored close-up of the head portrait of van Oort's unpublished drawing of the holotype of *Varanus prasinus* from Fig. 5.

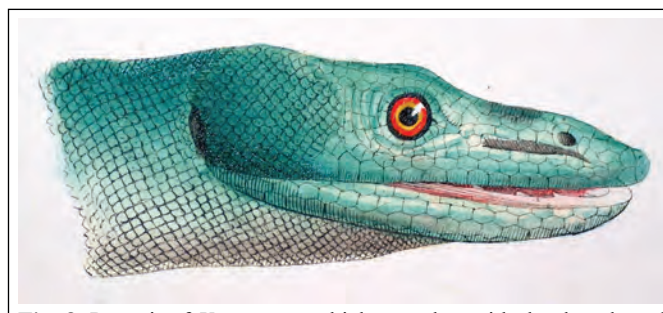


Fig. 8. Portrait of *V. prasinus* which, together with the dorsal total view, is part of table 5 (see Fig. 6) included in issue number 4 (published 1841) of Temminck's (1839-1847) "Verhandelingen".



Fig. 10. Head portrait of the holotype (RMNH 4812) of *Varanus prasinus*. Photo: André Koch.

ing, which means that the responsible engraver probably also had van Oort's watercolour for orientation. And, of course, the Arnz company had already published the first description by Schlegel (1839) including the portrait of *V. prasinus* (Fig. 7).

COMPARISON OF THE HEAD PORTRAITS OF THE HOLOTYPE OF *VARANUS PRASINUS*

A comparison of the two published head portraits (Figs. 7 and 8) reveals some differences between illustrations. The distinctive lateral skin folds make the neck appear significantly more structured in the illustration from 1839 (Fig. 7), an element that is lacking in the other two versions (Figs. 8 and 9), in which the skin is perfectly smooth. The nasal area on the other hand is similarly bulged as in the illustration from 1841 (Fig. 9).

Running parallel to the mouth, a fine furrow leads from near the lower edge of the eye about two or three scale rows above the supralabials past the nasal opening to disappear somewhere between the nose and tip of the snout. In some specimens, it ends almost at the tip of the head as, for instance, seen in van Oort's watercolour painting (Fig. 5), in which it is depicted somewhat curved. In the illustration from 1839 it leads as a straight line from the lower edge of the nostril to a very distinctive scale fold diagonally below the eye, which does not emerge in the other illustrations. If we now use the head

of the holotype as a comparison (Fig. 10), we retrieve this feature as well.

Müller and Schlegel (1845) overemphasized this line, especially in their description and in the corresponding illustration four years earlier, where it appears as a rather dark, broad and deep indentation (Fig. 8). Neither van Oort's watercolour nor the Leiden holotype give any reason to overemphasize this fine furrow, which Müller and Schlegel (1845: 42) call "huidplooi" (= skin fold). Even if this frenal stria is unmistakable, it does not deserve such an accentuated emphasis as in the portrait from 1841 (Fig. 8), even if it is easily detected in the living specimen running right from the top of the snout beneath the nostril to the lower orbital scale rows around the eye (Fig. 11).

After his sparse description of 1831, Gray (1845: 13) later referred to this feature of the "Green Lace Lizard. *Hydrosaurus prasinus*. *Monitor prasinus*" as well: "...with a brown streak on the cheek behind the nostrils". He referred directly to Schlegel's (1841) illustration and the detailed description by Müller and Schlegel (1845) and did not present his text as the result of his own observations. He simply cited both earlier contributions: "Müller, Verhan. Rept. t.5. Schleg. Abbild. 78, t.22, f.5.", with which, however, he also adopted and disseminated their misleading over-emphasis of this stria. What is striking here is that Gray (1845) referred to Müller's and Schlegel's (1845) chapter about monitor lizards in Temminck's "Verhandelingen", although it was

published the same year. The respective issue No. 12 appeared in June 1845 (Husson and Holthuis 1955). Conversely, this raises the question whether Schlegel (1839) might not have known of Gray's (1831a) description in the "Animal Kingdom" published eight years earlier, which in turn was not cited by him.

Another fold is emphasized by Müller and Schlegel (1845): "Eene langere, diepere plooi loopt van de keel lang de onderzijde van den hals tot aan de voorpooten" (= A longer, deeper pleat runs from the throat along the underside of the neck to the forelimbs). It is precisely this feature that seems to suggest that Schlegel — at least in 1841 — oriented himself less towards the watercolour than towards the holotype specimen itself (Fig. 10). What remains to be explained, however, is why his description of this feature was not reflected in the corresponding engraving (Fig. 7). It would of course be conceivable that the time lag of four years between the publications played a certain role, although — as mentioned before — one must presume that all engravings were decided upon and executed earlier.

There is another quite important feature of the head that is not over-emphasised, but completely lacking, the temporal stripe (see Fig. 11). It is baffling that the frenal stria attracted such attention, both textually and visually, whereas this item was not mentioned at all, either by Müller (1828) or Schlegel (1841), probably due to the fact that in the only specimen available this feature had probably faded over time in preservation. After nearly 200 years, in photos of the holotype (Fig. 10) this feature is no longer visible, whereas in live specimens (Fig. 11) the temporal stripe is expressed as a dark lateral band between eye and ear, often bordered by a brighter yellow-green band. However, this character differs depending on the area of distribution on New Guinea and the age of the animal.

However, in the freshly killed specimen — and that is the case in the holotype, even if it were already in ethanol for some time — the temporal stripe should have been detectable. It should not be forgotten that this common characteristic of monitor lizards also plays an important role in other species and is even taxonomically relevant: Thus, *V. cerambonensis* (Philipp et al. 1999) and *V. rainierguentheri* (Ziegler et al. 2007) differ from *V. indicus* (Daudin, 1802), among others, in the presence of this light temporal stripe (Auliya et Koch 2020).

Müller and Schlegel's (1845: 44) observation that "the iris shows in life, from the inside out, first a lemon yellow, then a high red and finally a black circle" correlates precisely with both the unpublished watercolour (Fig. 5) and the portrait from 1841 (Fig. 8), while the portrait from 1839 (Fig. 7) only presents a completely yellow, undifferentiated iris, which raises the question of whether Schlegel had any influence on the illustration in the respective publications. He could not orientate himself on the holotype, not only because its eyes



Fig. 11. Portrait of *V. prasinus* from the Vogelkop Peninsula. Note the light temporal stripe, which is lacking in the illustrations and the holotype, and compare the colour of the iris with the artistic illustrations in figures 5 to 7. Photo: Hans J. Jacobs.

were closed, but because the ethanol would have influenced the colour as well. A close look at a living specimen (Fig. 11) shows a light ring directly around the pupil and another reddish ring, between which a darker, black area extends.

DIFFERENCES BETWEEN THE VOUCHER SPECIMEN AND ITS ILLUSTRATIONS

Overall, a clear chronological sequence of the graphic representations does not seem to be reliable due to individual details. It cannot be claimed without contradiction that the engravings were clearly based on the watercolour as a template. In the engraving of the body some structures stand out that should be mentioned in comparison to the other illustrations. Above all the typical striped pattern is conspicuous in the way it is drawn. Van Oort's watercolour (Fig. 5) depicts about 13 black stripes, the first four clearly outlined in the upper part of the body, drawn more irregularly in the rear, between which there are various dark spots. In contrast, the picture from Müller and Schlegel's (1841) publication (Fig. 6) shows, after a single stripe on the neck, six double stripes with dotted bands in between and about nine single stripes gradually fading towards the base of the tail. Only the first two craniad stripes are clearly acute-angled. A comparison with the almost 200-year-old holotype is not easy (Fig. 2). About 19 bands can be seen between the neck and the hind legs, the first four clearly angled, the others running rather straight across the back, while Müller and Schlegel (1845) indicated 16 stripes, when stating that "the six ones in front of the body are split in two, and in each case divided in two parallel lines" (our translation). Obviously, they did not count the stripes dissolving posteriorly in the dorsal pattern. It is also noticeable that the front legs of the holotype start between the third and fourth transverse stripes (Fig. 2), whereas the drawings show only the single angle and first double stripe in front of the fore legs. Of course, the number of stripes may differ

between individuals and it has to be pointed out that specimens from certain distribution areas, at least in adults, show rather ocelli-shaped patterns or even a blurred, nearly patternless dorsal side. This is the case in the northern parts of New Guinea around Jayapura and as well in the south, around Merauke, whereas in the west, on the Vogelkop-Peninsula, the monitors exhibit clear dorsal bands. So, in the specimen on figure 1 we distinguish three stripes before the forelimbs and 13 between the limbs.

Müller and Schlegel (1845: 42) specified the total length of the holotype as 72 cm, of which 47 cm are accounted for by the tail. Thus, a snout-vent length of 25 cm remains which corresponds precisely with Müller's (1828) measurement right after the catch of the voucher specimen. The tail is initially almost round, later a little compressed at the sides and has slightly rectangular scales arranged in rings¹³.

Obviously, "with a furrowed keel", as Müller (1828) called it, refers to the dorsal double keel or ridge, which generally is absent in tree monitor lizards. However, it must be conceded that an indication of this morphological character — perhaps also depending on the nutritional state of the respective specimen — may be visible. This would explain why the caudal ridge can be recognized in van Oort's watercolour (Fig. 5), and also on the photo of the holotype (Fig. 2) it looks as if it were visible. At the end of the first third, the tail has the shape of a pointed triangle with rounded edges. Both the watercolour (Fig. 5) and the engraving of the entire specimen from 1841 (Fig. 6) take this into account, with the latter showing the ridge as a dark line, beginning around the first fifth of the tail and running straight over the entire body to the neck.

According to Müller and Schlegel (1845: 44), the beautiful grass or leaf green fades towards the sides to a green-yellow hue, which appears rather light green-whitish in both depictions (Figs. 5 and 6). The portrait from 1839 sets itself apart from this with a significantly darker shade of green (Fig. 8). Here, too, there is no clear evidence of what Schlegel used as a matter of reference. Was it the holotype or the unpublished watercolour? The illustration (Fig. 5), though, published in the same work fits the textual statements much more precisely.

THE LEGACY OF THE NATUURKUNDIGE COMMISSIE

With the capture of the first *V. prasinus* in New Guinea almost 200 years ago, the history of the scientific study of this fascinating monitor lizard species began with Müller's (1828) handwritten description and van Oort's watercolour depiction which we have discussed above. The previously unpublished materials, both in text and graphic reproduction, in particular allow an illuminating look at the early history of this monitor lizard species. What began with this first, and for a long time, only known voucher specimen has in the meantime developed

into a complex with currently nine recognized species. Next to *V. prasinus*, these are *V. beccarii* (Doria 1874), *V. kordensis* (Meyer 1874), *V. reisingeri* (Eidenmüller and Wicker 2005), *V. boehmei* (Jacobs 2003), *V. macraei* (Böhme and Jacobs 2001), *V. bogerti* (Mertens 1950), *V. keithhornei* (Wells and Wellington 1985), and *V. telenesetes* (Sprackland 1991), even if some questions regarding the taxonomic validity and status in one case or another have not yet been clarified (Koch et al. 2014). Nevertheless, in all likelihood, this recognized diversity is not the end and further discoveries may follow in the future. For instance, there are doubts as to whether *V. prasinus* represents just a single taxon that occurs throughout New Guinea. Not only the well-known place of discovery in Triton Bay, but also the colour pattern confirms the holotype to be a representative of the Vogelkop population of *V. prasinus*, although geographically Triton Bay does not belong to the Vogelkop Peninsula. A study on the exact borders of this phenotype's distribution area as well as the differentiation within the Emerald Tree Monitor lizards is in preparation.

For the moment, all available possibilities seem to have been exhausted to definitely clarify which specimen Gray found or did not find in Leiden at the time of his visit. Perhaps access to Gray's autobiographical writings, which are kept at the Natural History Museum in London, would shed some more light on this question.

In the course of our archive research, apart from the material on *V. prasinus*, which is published here for the first time, we came across an almost unbelievable amount of material that has not been published in printed form before, which is also of eminent interest with regard to other Indonesian species. The materials of the Natuurkundige Commissie provided online by Naturalis (<https://dh.brill.com/nco/>) represent a treasure trove that cannot be overvalued, not only from a taxonomic point of view, but also with regard to a historical natural history. It goes far beyond the possibilities of an individual to gain more than an overview of this complex material. Even if the main areas of interest of these early researchers at the time, such as birds and mammals not to mention fish, amphibians, insects, plants, and minerals, were to be left aside to concentrate exclusively on reptiles, the scope would go far beyond the usual range of an article and would rather call for a monographic treatise.

Even a very preliminary look at Salomon Müller's scientific writings in the Naturalis archives shows what an opus Müller and his colleagues created. The expedition to the East Indies certainly cannot be embraced here in its entirety, too many of the writings have not yet been evaluated and published in a tangible form. In the less than two months the group spent in the Lobo district of New Guinea, Müller and his fellow scientists described more than a dozen taxa of skinks, geckos, agamids, snakes, and monitor lizards, and quite a few of them were illustrated in watercolour by Pieter van Oort.

Moral considerations whether Müller should have been honoured as the describer of this species — and many more, considering the multitude of his handwritten descriptions —

¹³ „De twee bovenste rijen vormen eene zeer flauwe, dubbele kiel, die langs de geheele middellijn boven over den staart heenloopt“ (= The top two rows form a quite faint, double keel, which extends over the tail along the entire midline). (Müller and Schlegel 1845: 43–44).

are obsolete and obviously do not correspond to the attitude of the time. In this context it should be noted that the idea of copyright did not emerge until the end of the 19th century. But even then, it only referred to printed matters. Personal notes, especially those made on behalf of a governmental Commissie, were, from a legal point of view, not protected and were also not understood as intellectual property. Schlegel, as Müller's superior, certainly had no moral scruples about "using" these documents — like many others.

Nevertheless, it must be noted with regret that Müller's outstanding scientific achievement was not acknowledged and also not adequately appreciated. Be that as it may, Salomon Müller will forever be considered as the collector of the Emerald Tree Monitor (but see above). To this day, however, it was unknown that it was he who gave the species the name we still use: *Varanus prasinus*. After the arrival of the specimen in Leiden in 1831, this name became a so-called shelf name and was ennobled by Schlegel in 1839 as the official name of the species.

The scientific accomplishments the young researchers of the natural history commission achieved are unimpeachable. Therefore, with our contribution to the discovery and scientific description of the Emerald Tree Monitor we would like to honour these young scientists, of whom so many died much too early in the former colonial Dutch overseas possessions.

ACKNOWLEDGMENTS

First of all, we thank Robert Sprackland, who drew our attention to Pieter van Oort's unpublished watercolour of *V. prasinus* in the Naturalis archives. We owe a very special thank-you to Esther Dondorp and Karien Lahaise (both Naturalis, Leiden), without whose support, so much more difficult under the sign of Corona, we would not have gained access to some documents. We would also like to thank Marinus Hoogmoed (Belém, Brazil), Ivan Ineich and Patrick David (Paris, Muséum national d'Histoire naturelle), Paul Cooper (Natural History Museum London), and Kraig Adler (Cornell University) for their many hints. For their always amiable support in transcribing Salomon Müller's difficult handwriting, we thank the Schlegel specialists (in this case Friedrich Schlegel, the German romantic philosopher, not related to the herpetologist Hermann Schlegel) Almuth and Hans Dierkes as well as Hermann Patsch. Last but certainly not least, we thank Wolfgang Böhme (Zoologisches Forschungsmuseum Alexander Koenig, Bonn) for his everlasting support.

REFERENCES

- Allgemeine Bibliographie für Deutschland: eine Übersicht der Literatur Deutschlands nebst Angabe künftig erscheinender Werke und andern auf den literarischen Verkehr bezüglichen Mittheilungen und Notizen. Leipzig, Brockhaus (published between 1836 and 1892).
- Auliya, M. And A. Koch. 2020. Visual Identification Guide to the Monitor Lizard Species of the World (Genus *Varanus*). Guidance for the Identification of Monitor Lizards with current Distribution Data as well as short Explanations on Reproductive Characteristics and Captive Breeding as Support for Authorities of Species Protection Enforcement. *Bfn-Skripten*. 552:1–201.
- Böhme, W. 2003. Checklist of the living monitor lizards of the World (family Varanidae). *Zoologische Verhandelingen*. 341:3–43.
- Brandenburg, T. 1983. Monitors in the Indo-Australian Archipelago. Msc. Thesis, University of Leiden, Leiden, Netherlands. 98 p.
- Bucklitsch, Y., W. Böhme, and A. Koch. 2016. Scale Morphology and Micro-Structure of Monitor Lizards (Squamata: Varanidae: *Varanus* spp.) and their Allies: Implications for Systematics, Ecology, and Conservation. *Zootaxa*. 4153(1):1–192.
- Daudin, F. M. 1802. *Histoire naturelle, générale et particulière des Reptiles, Tome troisième*. F. Dufart, Paris. 452 p.
- Eidenmüller, B. And R. Wicker. 2005. Eine weitere neue Wuranart aus dem *Varanus prasinus*-Komplex von der Insel Misol, Indonesien. *Sauria*. 27(1):3–8.
- Engelmann, W. 1846. *Bibliotheca historico-naturalis. Verzeichniss der Bücher über Naturgeschichte welche in Deutschland, Scandinavien, Holland, England, Frankreich, Italien und Spanien in den Jahren 1700–1846 erschienen sind*. Verlag Wilhelm Engelmann, Leipzig. 786 p.
- Frost, D. R. 2021. Amphibian Species of the World: an Online Reference. Version 6.1. American Museum of Natural History, New York, USA. [last accessed 12 March 2021].
- Gassó, E., L. Stork, A. Weber, M. Ameryan, and K. Wolstencroft. (Editors) 2020. *Natuurkundige Commissie Archives Online*. Leiden: Brill. [last accessed 16 March 2021].
- Gebhardt, L. 1964. *Die Ornithologen Mitteleuropas*. Brühlscher Verlag, Gießen. 403 p.
- Gersdorf, E. G. 1840. *Repertorium der gesamten deutschen Literatur*. Jahrgang 1840, 26. Band. F. A. Brockhaus, Leipzig.
- Gersdorf, E. G. 1844. *Leipziger Repertorium der deutschen und ausländischen Literatur*. Jahrgang 1844, 5. und 6. Band. F. A. Brockhaus, Leipzig.
- Gray, J. E. 1831a. A synopsis of the species of the class Reptilia. Pp. 1–110 In: Griffith, G. And E. Pidgeon, (Editors): *The Animal Kingdom Arranged in Conformity with its Organization, by the Baron Cuvier. Vol. 9: The Class Reptilia Arranged by the Baron Cuvier, with Specific Descriptions*. Whittaker, Treacher, and Co., London.
- Gray, J. E. 1831b. Synopsis reptilium: or short descriptions of the species of reptiles. Part I., Cataphracta. Tortoises, crocodiles, and enaliosaurians. Treuttel, Wurtz, and Co., London. 85 p.
- Gray, J. E. 1838. Catalogue of the slender-tongued saurians, with description of many new genera and species. *Annals of natural history*. 1:274–283, 388–394.
- Gray, J. E. 1845. Catalogue of the Specimens of Lizards in the Collection of the British Museum. Trustees of the British Museum, London. Xxviii, 289 p.
- Gray, J. E. 1996. A synopsis of the species of the class Reptilia. Reprint with an editorial note by Thomas Ulber. Herprint International, Bredell, South Africa.
- Gunther, A. E. 1980a. *The founders of science at the British Museum 1753–1900*. Halesworth Press, Halesworth, Sussex, UK. 1x, 219 p.
- Gunther, A. E. 1980b. The miscellaneous autobiographical manuscripts of John Edward Gray (1800–1875). *Bulletin of the British Museum (Natural History)*, Hist. Ser., 6(6):199–244.
- Fransen, C. H. J. M., L. B. Holthuis, and J. P. H. M. Adema. 1997. Type-catalogue of the Decapod Crustacea in the collections of the Nationaal Natuurhistorisch Museum, with appendices of pre-1900 collectors and material. *Zoologische Verhandelingen*. 311: xvi, 1–344.

- Hildenhausen, T. 2013. Heinrich Kuhl – Das Leben eines fast vergessenen Naturforschers aus Hanau. *Neues Magazin für Hanauische Geschichte*. 2013:111–214.
- Huizinga, F. H. 2004. *Merkusoorde: Sources on the First Dutch Establishment in New Guinea (1828–1836)*. Naskah Sumber Arsip Nasional Republik Indonesia. 211 p.
- Husson, A. M. and L. B. Holthuis. 1955. The dates of publication of “Verhandelingen over de natuurlijke Geschiedenis der Nederlandsche overzeesche Bezittingen” edited by C. J. Temminck. *Zoologische Mededelingen* 34:17–24.
- ICZN 1959. Opinion 540. Protection under the plenary power of the specific names *bengalensis* Daudin, [1802], as published in the combination *Tupinambis bengalensis*, and *salvator* Laurenti 1768, as published in the combination *Stellio salvator*. *Opinions and Declarations rendered by the international Commission on zoological Nomenclature*. 20(7):77–85.
- ICZN 1999. International Code on Zoological Nomenclature. The International Trust for Zoological Nomenclature [Accessed 21 February 2021].
- Klaver, C. 2007. *Inseparable Friends in Life and Death: Heinrich Kuhl (1797–1821) and Johan Conrad van Hasselt (1797–1823), Students of Prof. Theo Van Swinderen*. Barkhuis, Groningen.
- Koch, A., N. Ernst, B. Eidenmüller, and F. Kraus. 2014. New data on the rare *Varanus bogerti* Mertens, 1950 and *V. Telenesetes* Sprackland, 1991 (Squamata: Varanidae), two endemic monitor lizard taxa from island groups off southeastern New Guinea. *The Herpetological Journal*. 24(2):111–122.
- Kuhl, H. 1820. *Beiträge zur Zoologie und vergleichenden Anatomie. Erste Abtheilung: Beiträge zur Zoologie*. Verlag der Hermannschen Buchhandlung, Frankfurt am Main. 152 p.
- Lichtenstein, M. H. 1818. *Das Zoologische Museum der Universität zu Berlin*, 2. Auflage. Ferdinand Dümmler, Berlin. 120 p.,
- Linnaeus, C. 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Laurentius Salvius, Holmiæ (= Stockholm). 824 p.
- Mees G. F. 1994. Vogelkundig onderzoek op Nieuw Guinea in 1828. Terugblik op de ornithologische resultaten van de reis van Zr. Ms. Korvet Triton naar de zuid-west kust van Nieuw-Guinea. *Zoologische Bijdragen*. 40:3–64.
- Merrem, B. 1820. Versuchs eines Systems der Amphibien. J. C. Kreiger, Marburg. 191 p.
- Mertens, R. 1942. Die Familie der Warane (Varanidae). Erster bis dritter Teil. *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft*. 462, 465, 466:1–391.
- Mertens, R. 1959. Liste der Warane Asiens und der Indo-australischen Inselwelt mit systematischen Bemerkungen. *Senckenbergiana biologica*. 40(5/6):221–240.
- Mertens, R. 1963. Liste der rezenten Amphibien und Reptilien; Helodermatidae, Varanidae, Lanthanotidae. *Das Tierreich*. 79:x, 1–26.
- Meyer, A. B. 1874. Eine Mittheilung von Herrn Dr. Adolf Bernhard Meyer über die von ihm auf Neu-Guinea und den Inseln Jobi, Mysore und Mafoor im Jahre 1873 gesammelten Amphibien. *Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin*. 1874:128–140.
- Mörzer Bruyns, W. F. J. 2018. Met de Triton en de Iris naar Nieuw-Guinea. Walburg Pers. Zutphen. 384 p.
- Müller, S. 1828. *Varanus prasinus* Müll[er]. Unpublished manuscript written in Lobo, New Guinea, dated August 1828. nco_NNM001001113_127 in Gasso, E., Stork, L., Weber, A. et al. ed., *Natuurkundige Commissie Archives Online*. Leiden: Brill 2020. Naturalis Biodiversity Center Leiden; The Netherlands.
- Müller, S. 1857. *Reizen en onderzoekingen in den Indischen archipel: gedaan op last der Nederlandsche Indische regering, tusschen de jaren 1828 en 1836*, Band 2. F. Muller, Amsterdam. 350 p.
- Müller, S. and H. Schlegel. 1845. Over de in den Indischen Archipel levende hagedisachtige Dieren van het Geslacht Monitor. Pp. 37–48 In: C. J. Temminck, (Editor) *Verhandelingen over de natuurlijke Geschiedenis der Nederlandsche overzeesche Bezittingen*, Vol. 3: Zoologie. A. Arnz & Co., Leiden.
- Musters, C. J. M. 1983. Taxonomy of the genus *Draco* L. (Agamidae, Lacertilia, Reptilia). *Zoologische Verhandelingen*. 199:1–120.
- Nieuwendijk, K. 2011. Met van Oort naar verre oorden. Kennisoverdracht vóór de fotografie. Master thesis, Universiteit Leiden. 88 p.
- Rouschop, S. L. E. 2020. The Price of Knowledge – Science, imperialism and the 1828 Triton expedition. Faculty of Science Theses (Master thesis), Utrecht University. 60 p.
- Schlegel, H. 1837–44. *Abbildungen neuer oder unvollständig bekannter Amphibien, nach der Natur oder dem Leben entworfen und mit einem erläuternden Texte begleitet*. Arnz & Co., Düsseldorf, xivö, 141 p.
- Seba, A. 1734–65. *Locupletissimi rerum naturalium thesauri accurata descriptio, et iconibus artificiosissimis expressis, per universam physicis historiam*. Tomus II. Janssonio-Waesbergios, J. Wetstenium & Gul. Smith, Amsterdam.
- Sherborn, C. D. 1922. *Index Animalium sive Index nominum quae ab A. D. MDCCLVIII generibus et speciebus animalium imposita sunt*. Sectio secunda, part 1. Introduction, bibliography and Index A—Aff. British Museum, London. Vii–cxxx, 128 p.
- Sirks, M. J. 1915. *Indisch Natuuronderzoek*. V. H. Ellerman, Harms & Co., Amsterdam. 303 p.
- Stejneger, L. 1907. Herpetology of Japan and Adjacent Territory. *Bulletin of the United States National Museum*. 58:1–577.
- Temminck, J. C. 1825. Voorschrift, hoedanig te handelen met voorwerpen van Natuurlijke Historie, ten einde dezelve behoorlijk te verzenden en voor bederf te bewaren; ten gebruike van het Museum van Natuurlijke Historie te Leyden, Leiden.
- Temminck, C. J. (Editor) 1839–44. *Verhandelingen over de natuurlijke Geschiedenis der Nederlandsche Overzeesche Bezittingen*. S. Luchtman and J. Luchtman, Leiden.
- Van Wingerden, P. 2020. Science on the edge of empire: E. A. Forsten (1811–1843) and the Natural History Committee (1820–1850) in the Netherlands Indies. *Centaurus*. 62(4):797–821.
- Veth, H.-J. 1879. *Overzicht van hetgeen in het bijzonder door Nederland gedaan is voor de kennis der Fauna van Nederlandsch Indië*. S. C. Van Doesburgh, Leiden. 204 p.
- Weber, A. 2019. Collecting Colonial Nature: European Naturalists and the Netherlands Indies in the Early Nineteenth Century. *BMGN – Low Countries Historical Review*. 134(3):72–95.
- Wichmann, A. 1910. *Nova Guinea: Résultats de l'expédition scientifique Néerlandaise à la Nouvelle-Guinée in 1903 sous les auspices de Arthur Wichmann*, Volume II 1er partie. Entdeckungsgeschichte von Neu-Guinea (1828–1885). E. J. Brill, Leiden. 369 p.
- Further sources: Entry catalogue of the Naturalis museum, Leiden, the Netherlands.

We suggest the following format for citing this article:

Jacobs, H. J. and A. Koch 2021. On the Discovery and Scientific Description of the Emerald Tree Monitor, *Varanus prasinus* (Schlegel, 1839). *Bibliotheca Herpetologica* 15(7):61–76.

How to Raise a Bullfrog—The Literature on Frog Farming in North America

C. Kenneth Dodd, Jr.¹ and Mark R. Jennings²

¹Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611 USA, terrapene600@gmail.com

²Rana Resources, P.O. Box 2185, Davis, California 95617 USA, and Research Associate, Department of Herpetology, California Academy of Sciences, San Francisco, California 94118 USA, RanaResources@aol.com

American Bullfrogs (*Lithobates catesbeianus*) are one of the most heavily exploited amphibians in the world and have been so at least since the late 1800s. The primary purpose of commercial use has been for frog's legs for human consumption. Although frog "gigging" continues to supply frog legs for local consumption, much of today's commercial trade results from vast "frog farms," both in the United States and in numerous other countries. For example, Rana Ranch Commercial Bullfrogs in Idaho ships *L. catesbeianus* to 43 states for commercial use as well as "to stock lakes, wetlands, ornamental koi ponds, water gardens and golf course water features" (Troyer 2019).

Attempts at frog farming began in the United States and Canada before 1900, and perhaps earlier than 1888 in Ontario (Meehan and Andrews 1908; Priddy and Culley 1971). For example, Anonymous (1899) reported on a small frog farm in New York, and brochures or newspaper and magazine references to frog farms are available for Arkansas, California, Hawaii, Illinois, Louisiana, Massachusetts, Nevada, North Carolina, Ontario, Oregon, Texas, Washington, and Wisconsin among other locations; doubtless many others existed throughout the U.S. and Canada. Chamberlain (1897) noted that a frog farm in the Trent River Basin, Ontario, had been in operation for "about 20 years." However, subsequent research on this frog farm by Clyde Louis Patch of the Department of Mines, Victoria Memorial Museum, Ottawa, Canada, revealed that the farm was merely a suitable area which was stocked by means of mature mated frogs. No attempt was made to confine the frogs until they were wanted for market, nor was food of any sort supplied. Evidently, a naturally suitable area was stocked and the annual increase collected and marketed (26 November 1926–12 April 1927 letters from Clyde Louis Patch to Tracy Irwin Storer¹). This early example shows that frog farms have often operated more like a vast network of persons collecting frogs and transporting them to a central location rather than true closed-cycle operations.

The idea of farming frogs was also given a major boost by the release of the first western novel *The Virginian*, by Owen Wister (1902). Originally published as a series of short stories in *Harper's Magazine* and *The Saturday Evening Post* between November 1893 and May 1902, one chapter is entirely devoted to the fictional story of a "Tulare Frawg Ranch"

in California. Although the story is based on some factual elements, as are many other incidents described in *The Virginian* (see Jennings and Hayes 1984), its immense popularity with a wide audience in the United States and elsewhere made the concept of frog farming much more plausible, if not delusional (Schmidt 1935). Additionally, local newspaper editors found the subject particularly noteworthy for publication, hence the increased number of frog farm magazine and newspaper articles that appear at the beginning of the 20th Century (e.g., see Heard 1904).

Since the late 1800s, American Bullfrogs have been recognized by private, state, and federal agencies as one of the primary species to fulfill the demand for frog's legs (see complete list in References; also see Wright 1920² and Storer 1933; for an opposing view, see Schmidt 1946). During the 1920s and 1930s, Pig Frogs (*L. grylio*) were purported to make up 60 or 70% of the frog meat consumed in the United States, especially for the market in canned frog legs (December 31, 1936 letter from Thomas Barbour to Tracy Irwin Storer¹). However, *L. grylio* can only live for up to about 12 hours out of water, hence it was less used by the trade outside of the southern states where it naturally occurs (Storer, unpublished field notes).

These publications supply a wealth of information on raising *L. catesbeianus* in addition to marketing. For example, Storer (1933) noted that there was already a plentiful supply of American Bullfrogs in California, and that attempts to start frog farms in that state began in 1898, based on a supply of imported bullfrogs "from somewhere in the eastern States." Subsequent research has shown that American Bullfrogs were known to be introduced to a frog farm in El Cerrito, Contra Costa County, California, in 1896; they received imported stock from Maryland and Florida (Heard 1904; Jennings and Hayes 1985). A frog farm in North Carolina imported its breeding stock from Louisiana (Lucas 1965), as did a large number of other farms throughout the country. Undoubtedly many frogs escaped and bred with local bullfrog populations or established breeding populations far outside the natural range of the species.

Although most farms have focused on *L. catesbeianus* because of their size and quantity of meat, several other species have been mentioned in the literature on frog farming, particularly Northern Leopard Frogs (*L. pipiens*), Southern Leopard

ard Frogs (*L. sphenoccephalus*) [which were often referred to as “leopard frogs” in earlier publications], Pig Frogs, Green Frogs (*L. clamitans*, although Dunn, 1932, used “green frog” for *Rana pretiosa*), and California Red-legged Frogs (*Rana draytonii*, as *R. aurora*). For example, the frog ranching operation mentioned above at El Cerrito, California, was carried out from 1894–1907 and stocked both *R. draytonii* and *L. catesbeianus*. Although precise information on the numbers produced are unavailable, this operation purportedly made an \$1,800.00 profit by selling 31,200 frogs in 1903 (Heard 1904). Interviewed some 22 years later, the former owner reported that such statements were “not to be relied upon” (Storer, unpublished field notes¹). Additionally, this operation was a major source of *L. catesbeianus* released into other locations, as well as Hawaii (Bryan 1932; Jennings and Hayes 1985). Storer (1933) mentions that several other frog farms were established in California from 1900–1930, but he does not mention which species were involved. A careful review of his files and unpublished field notes shows that the species involved was entirely *L. catesbeianus* (Jennings 2004). An additional example is a frog farm that was established in the Orland Valley of California in 1951, importing bullfrogs from Louisiana as stock (Barnum 1953). Escaped *L. catesbeianus* likely populated areas previously occupied by a large *R. draytonii* population as the frog farms failed.

Pennsylvania established the first major state-led effort at commercial frog farming in 1899, but many problems were encountered among multiple hatcheries, and the attempt was not successful (Meehan and Andrews 1908). Pennsylvania maintained interest in commercial frog raising at least through the late 1920s (Buller 1928). By the 1930s, interest in commercial frog farming appeared to gain strength, in part due to the state of Louisiana’s interest in aquaculture, which had been initiated around 1916 under the auspices of the Southern Biological Supply Company (Viosca 1931, 1934). Louisiana State University began extensive research into bullfrog culture in the late 1960s (Culley and Gravois 1970, 1971; Priddy and Culley 1971; Culley et al. 1978). Successful frog culture was carried out in Arkansas and Louisiana by the early 1970s. Today, American Bullfrogs are highly sought after for commercial farms, and they have been introduced throughout the world, often with known or suspected deleterious effects on native faunas. Commercial bullfrog farming is still promoted by the UN/FAO (http://www.fao.org/fishery/culturedspecies/Rana_catesbeiana) and on numerous Internet sites (e.g., Patera 1978), despite concerns that frog farms are rarely successful, at least in North America (e.g., Helfrich et al. 2009; Missouri Department of Conservation undated).

Pennsylvania’s and Louisiana’s pioneering efforts at frog culture did not originate out of the blue. Frogs were plentiful and there was a ready market in large cities, such as New York, Philadelphia, Chicago, St. Louis, San Francisco, Boston, Baltimore, Washington, D.C., and New Orleans. During the Great Depression, in particular, there was an explosion of interest in developing small self-sustaining farming opera-

tions as a means to help farmers survive the economic catastrophe affecting rural North America. As noted by Laskow (2017), many of these ventures were promoted by “get rich quick” advertisements and brochures that promised great financial return for minimal investment. Concern about the get rich quick nature of the industry even drew mention from respected publications of the time, such as Scientific American (Montgomery 1936). Interest in frog farming resulted in a cascade of “how to” booklets and pamphlets offering advice on rearing and marketing *L. catesbeianus*. Some of the information was reasonably accurate, but other suggestions were simplistic, exaggerated, or inaccurate. Not surprisingly, some farms offered “giant,” “mammoth,” or “jumbo” bullfrogs as starter stock and shifted their focus to becoming a supplier to small farmers rather than a supplier to frog meat markets.

STATE AND FEDERAL PUBLICATIONS

The earliest paper to discuss the potential for frog farming in the United States is Chamberlain (1897). Frederic Morton Chamberlain (29 June 1867–17 August 1921) was a fishery biologist with the U.S. Bureau of Fisheries who had extensive first-hand experience with frogs in the commercial markets, especially in California and the Midwest (Jennings 1987). His paper includes information on the value of frogs as food, frog hunting, basic life history information, the species that might serve as food, and suggestions for frog culture. The emphasis seems to be on gathering tadpoles for stocking wetlands and letting the frogs do the rest. Chamberlain’s suggestions are general, such as protecting the ponds from predators, the need for and the difficulties in supplying live food for post metamorphs, and ensuring that stocked areas have vegetation. He noted that most such operations have not been successful as true farms because of the difficulties in supplying live food to post metamorphs. Rather than frog culture, the operation he discusses might be more accurately considered ranching that relies on wild stock for eggs and tadpoles.

The U.S. Bureau of Fisheries in the Department of Commerce, and later in the U.S. Department of Interior (as the U.S. Fish and Wildlife Service) after Governmental reorganization in 1939, have issued 4–8 page leaflets on frog farming [in the early years noted as I-2 for “Informational Leaflet #2], mostly covering the same information as Chamberlain, and these have been revised several times and appear with multiple dates (e.g. USDC 1922, 1932a, 1932b, 1933; USDI 1944, 1956). They appear to have started sometime after 1910 as short 1–2 page letters, were printed up in runs of 500, and then revised and reprinted as supplies were exhausted. The content increased substantially after Albert Hazen Wright (15 August 1879–4 July 1970) of Cornell University was hired in 1916 to address a number of questions regarding frog culture (the conclusions of which are published in Wright 1920). These short leaflets (Fig. 1) note additional information on the potential for farming frogs, such as by integrating frog farming and muskrat or crayfish raising with rice planting, diseases, protective regu-

lations, marketing, how to kill “objectionable” frogs, and shipping frogs alive. They provide suggestions for making dead prey appear alive, using stocked fish as live food, and building a pond, but not all the information is accurate based on current research. For example, USDI (1956) recommends stocking ponds with an equal sex ratio, as “a male usually pairs with but one female during a season” (see Howard 1988). USDC (1932b) is particularly interesting in that it provides information on the frog industry in 1931 (operating units and catch) and a list of potential buyers.

As noted above, Pennsylvania appears to be the first state to have a research program designed to produce frogs commercially, and the state’s Department of Fisheries produced the first state-sponsored “how to” manual on frog farming (Meehan 1906; Fig. 2) and later, one on tadpole rearing (Buller 1928). The 1906 bulletin covered background information on frogs, pond development, fencing, food, enemies and how to protect rearing stock, the care of tadpoles and post metamorphs, algae, and gathering eggs from the wild and transplanting them to a created or natural pond. In short, it provided the general format for topics covered by most subsequent manuals. The usefulness of the manual was enhanced by a series of popular articles illustrating frog farming and its potential (Meehan 1908a, b). The results were also published as a chapter in the book published by Meehan (1913) regarding fish culture that was widely available to the public at \$1.00 per copy.

The state of Louisiana published a series of pamphlets beginning in 1931 covering the usual information on life history, species, economics, and the potential for farming. Information on the frog industry throughout the country was included, but the pamphlet noted there were no commercial farms in the state in 1931 (Anonymous 1931a; Fig. 3). A booklet with the same title was republished in 1935 (and then republished again dated 1938 and 1939) that slightly expanded the original edition with more information on how to build and maintain a pond to rear frogs. Like Louisiana, a number of other state agencies noted the potential for the development of their frog industry through artificial propagation (Dyche 1914; Baker 1942), but no propagation manuals were produced.

The second state-sponsored frog farming manual was produced by Florida’s Department of Agriculture (Stoutamire 1932). As with other pamphlets, the same general topics were discussed. Stoutamire noted that American Bullfrogs were already being imported to Palatka, Putnam County, Florida, by that time from Louisiana to stock frog ponds. The short manual included very specific information on frog ponds

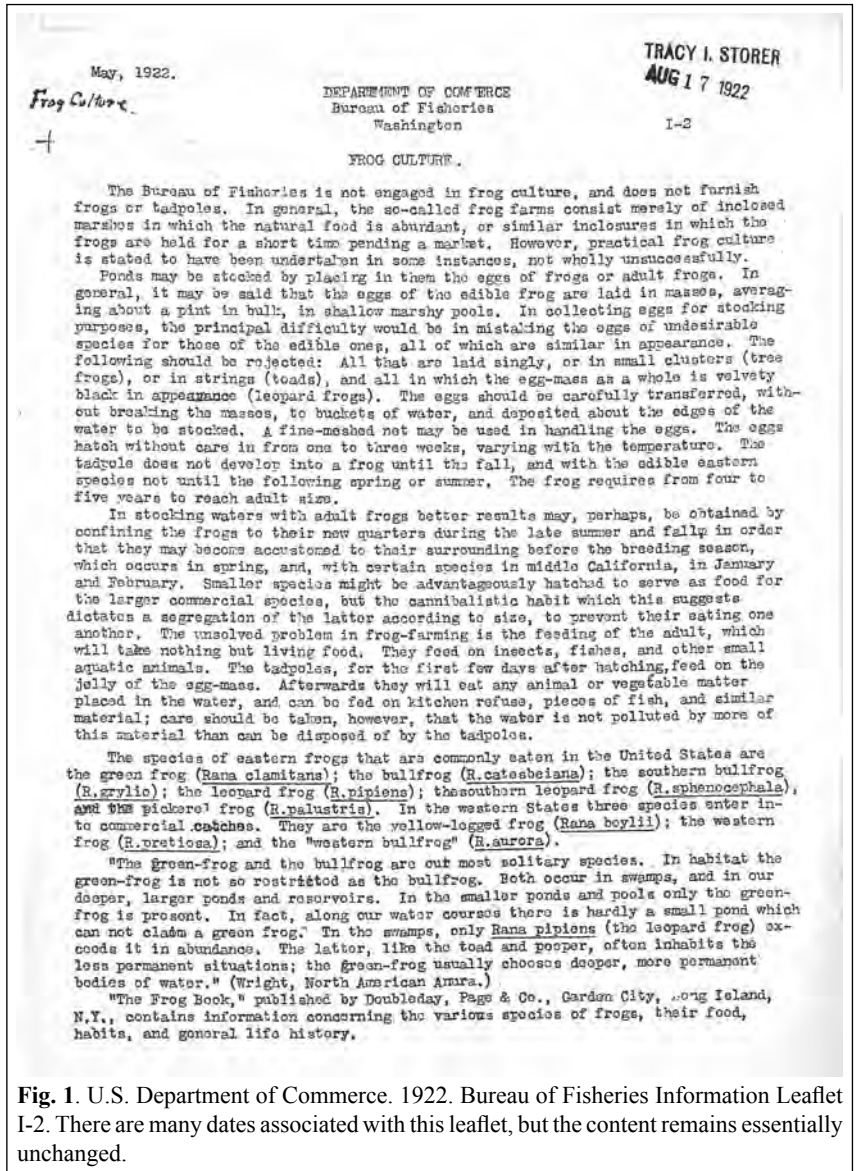


Fig. 1. U.S. Department of Commerce. 1922. Bureau of Fisheries Information Leaflet I-2. There are many dates associated with this leaflet, but the content remains essentially unchanged.

(e.g., “a pond of 10,000 square feet will produce on an average about 10,000 full sized tadpoles in one to two years,” if initially stocked with 12 pairs of frogs). The booklet also discussed frog hunting, focusing on hunters from the region near Fort Green and Wauchula (Hardee County), Florida, and marketing. However, it also noted that as of 1932, there were no “scientific data available on the cultivation of frogs in this state.” By 1936, however, the situation had changed.

The first really slickly produced state frog manual was published by the Florida Department of Agriculture in 1936 (reprinted 1952) (Fig. 4). The booklet included much more extensive information than any previous state or federal pamphlet or manual, and included a large number of black and white photographs supplied by the American Frog Canning Company in Louisiana and from local producers. There were at least two large frog farms operating in Florida at this time, Southern Industries and the Florida Frog Farm Corporation in Highland City, Polk County. The booklet included histori-

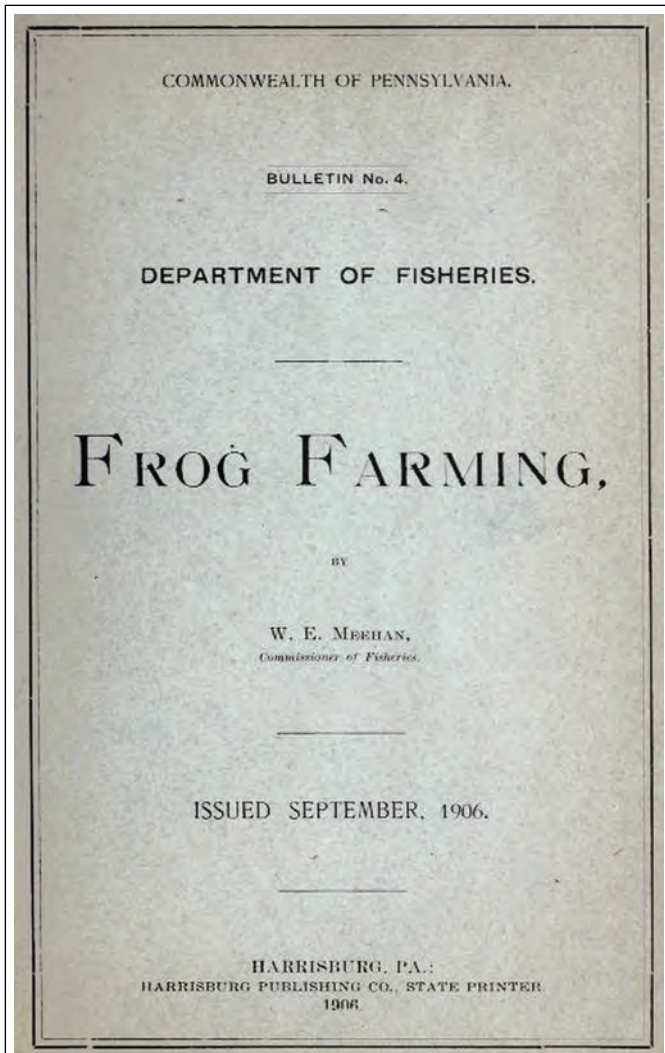


Fig. 2. Cover of W.E. Meehan. 1906. *Frog-farming*. Pennsylvania Department of Fisheries, Bulletin No. 4. This is the first state-sponsored manual on how to raise bullfrogs.

cal photos of Florida frog farms, as well as an interview with Frank Bertis Cramer, Sr. (15 November 1864–15 February 1950) of Southern Industries, Inc., located north of Tampa, Hillsborough County. At that time, Mr. Cramer was a local rancher, as well as a real estate broker. In the publication, he detailed his operations, production, and marketing. Of interest to herpetologists is how Cramer used a drift fence to trap fiddler crabs for use as live prey for his adult bullfrogs (photo p. 37). The publication freely borrowed sections on frog raising in France and Japan from other publications, as well as recipes supplied by the American Frog Canning Company.

PRE 1930s PRIVATE PUBLICATIONS

The first privately-produced “how-to” frog farming manual was published in California by S.C. Coombes (1902; Fig. 5). Samuel Charles Coombes (8 September 1833–23 October 1907) came to the business of frog culture late in life. A na-

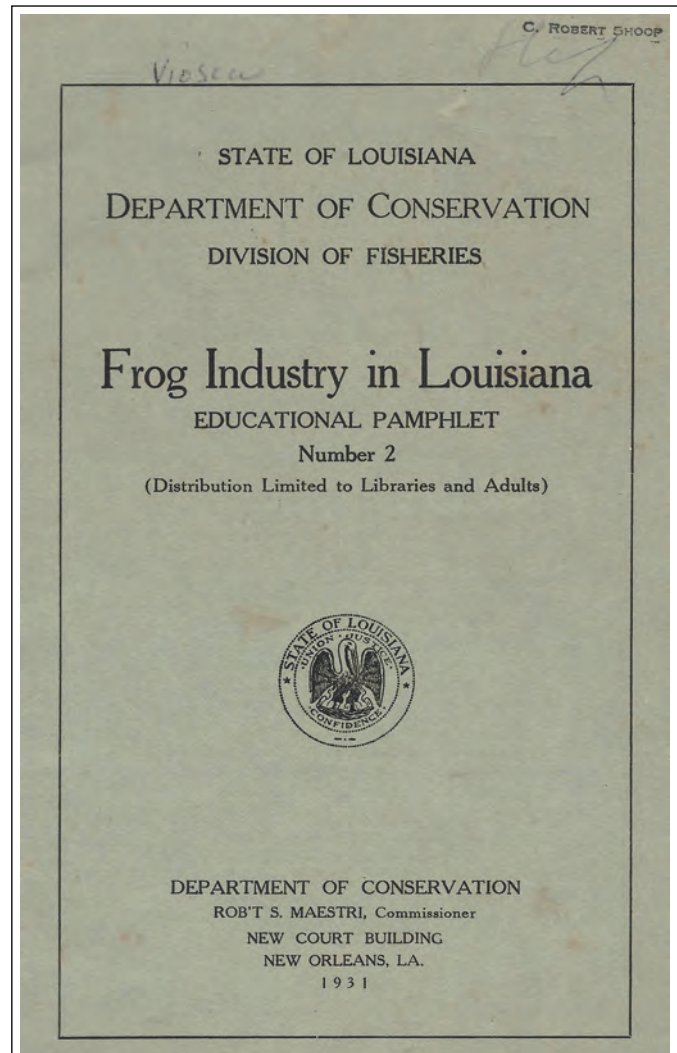


Fig. 3. Cover of *Frog Industry in Louisiana*. Louisiana Department of Conservation, Division of Fisheries Educational Pamphlet No. 2, 1931.

tive of Gosport, England, he worked at a number of trades, including as a merchant seaman, a brick manufacturer, and finally in the manufacture and sale of artificial manure. After immigrating with his family to the United States from England in 1888, he settled in San Francisco. Soon after, he acquired the well-established Vienna Sausage Company, which sold all kinds of fresh meats, as well as producing sausage.

Not long after Coombes was in business, he found it difficult to keep frog meat in stock with demand always exceeding the supply he could procure. Thus, after moving from San Francisco to a house in South San Francisco, San Mateo County in the early 1890s, he and his eldest son Charles Wesley Coombes (24 December 1862–23 November 1945), started experimenting with raising frogs on their “Frog Ranch” in order to stock their store with frog meat on a regular basis. Coombes (1902) is an outcome of those early efforts.

Rather than being partitioned into sections by subject, the booklet is a narrative of what to do to raise frogs based on his

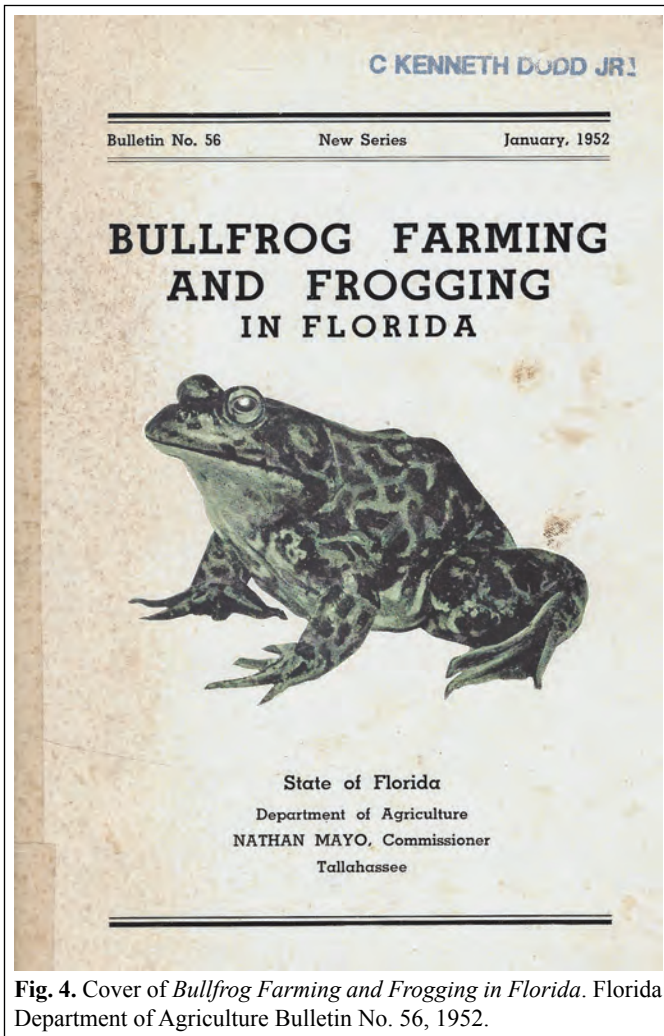


Fig. 4. Cover of *Bullfrog Farming and Frogging in Florida*. Florida Department of Agriculture Bulletin No. 56, 1952.

experiences at his “frogger” or “frog ranch.” In it, he noted his frustration with finding literature on the commercial raising of frogs, so he decided to detail the problems of frog raising (habitat requirements, food, predators, protection from direct sun and excessive heat, marketing) and the solutions he devised by trial and error. He is known to have relied on California Red-legged Frogs (*Rana draytonii*) for his farm stock, although he considered trying to cross *L. catesbeianus* with *R. draytonii*. He gave up on that, in part, because his French contacts advised him that *L. catesbeianus* had “a toughness of the flesh” and a “peculiar rank smell.” The only illustration is the development of the frog taken directly from Alcock (1884), a book that he would have been familiar with in England.

Coombes sent at least 9 live specimens of *R. draytonii* collected during July of 1905 to Mary Cynthia Dickerson (7 March 1866–8 April 1923) of Rhode Island Normal School for her use in examining the body structures, color patterns, and behaviors of this species for inclusion in her upcoming major work regarding the frogs of the United States and Canada. At least some of the frogs were eventually preserved and deposited in the herpetology collection of the American

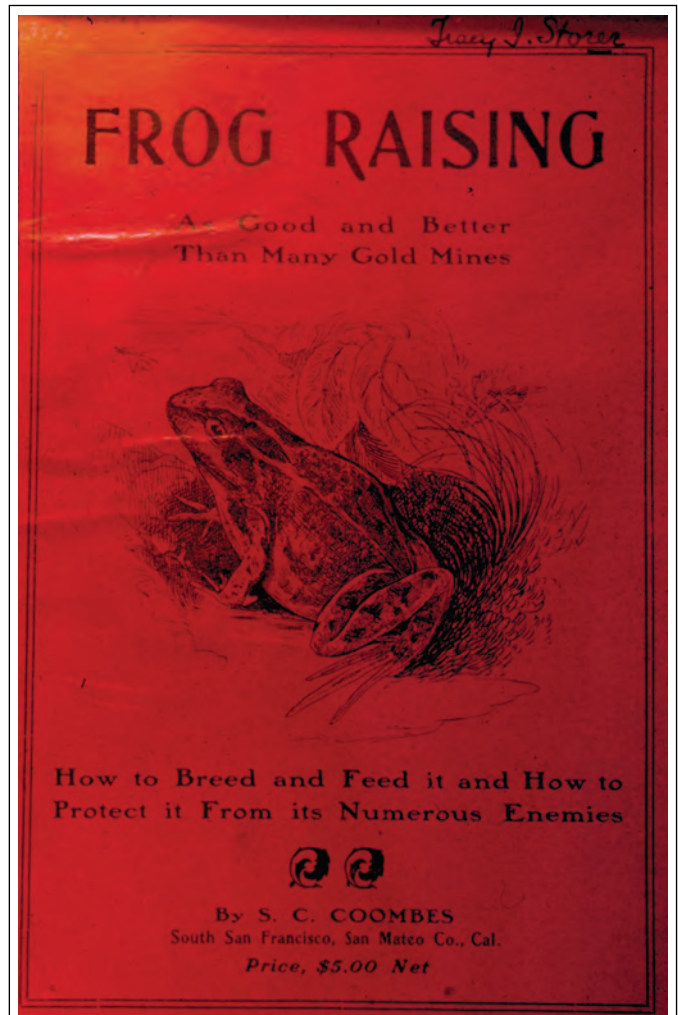


Fig. 5. Cover of *Frog-raising* by S. C. Coombs, San Mateo County, California, 1902. This is the first known frog raising manual produced in North America.

Museum of Natural History. Subsequently, Dickerson (1906) mentions the frog ranch and a few ecological facts on *R. draytonii* that were supplied by Coombes. Her book also provides the first scientific review of the first publication on frog farming because immediately after the listing of Coombes (1902) on page 242, the following statement appears in parenthesis: “This is a pamphlet sold in sealed packages at a price of five dollars. It is almost valueless.”

Coombes was perceptive enough to send copies of his publication to the Library of Congress in Washington, D.C. and the British Patent Office in London in order to prevent copyright infringement. Because of this, we know that his work was published in 1902. However, relatively few pamphlets were actually sold outside of the Bay Area of California, probably due to Dickerson’s (1906) statements and Coombes’ death in 1907 due to typhoid fever.

With the passing of the elder Coombes, his son Charles continued raising and selling frogs (including American Bullfrogs), as well as “terrapins” [=Western Pond Turtle

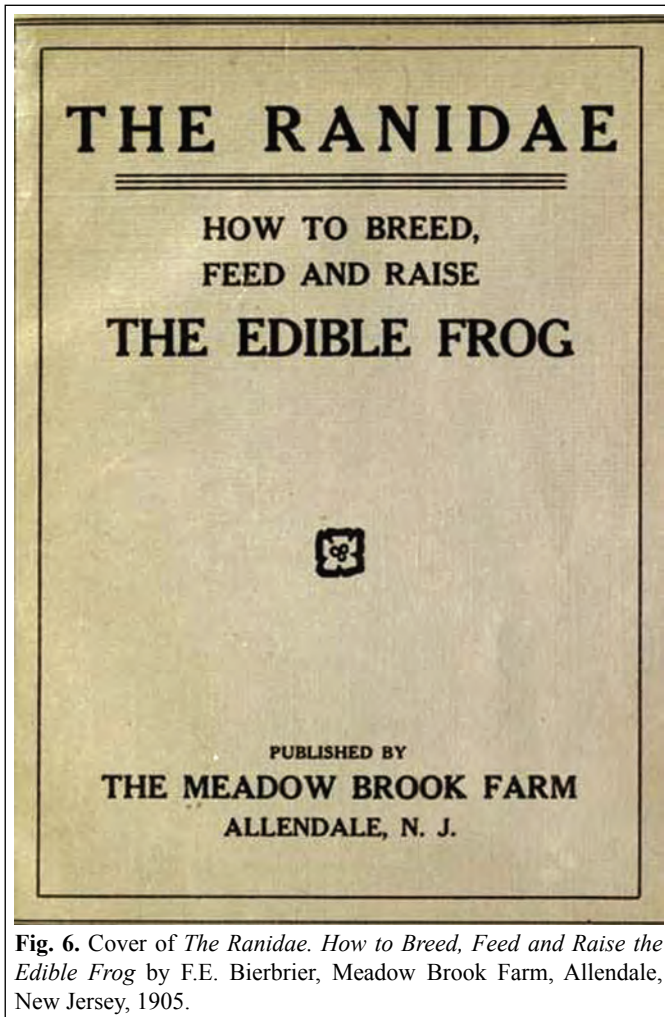


Fig. 6. Cover of *The Ranidae. How to Breed, Feed and Raise the Edible Frog* by F.E. Bierbrier, Meadow Brook Farm, Allendale, New Jersey, 1905.

(*Actinemys marmorata*)]. Around 1917, he moved to San Francisco where he worked for a number of dealers selling frogs and terrapins. Even well into his late 70s, Charles was still working in the business of “frog raising” and selling frogs and terrapins through his rented residence at 215 Carl Street in San Francisco. He eventually retired from the business during World War II.

A second private publication also stems from a frustration with seeing a great number of frogs (in this case, *L. catesbeianus*), a desire to eat frogs, a ready nearby market, and a lack of information on how to raise frogs. This booklet (1905; Fig. 6) was published by Francis Edward Bierbrier (?? May 1867–29 Dec. 1929), a furniture maker living in New York but owner of Meadow Brook Farm in Allendale, Bergen County, New Jersey. Bierbrier raised frogs, poultry and collie dogs at his New Jersey farm. He exhibited a revolving bookcase at the International Universal Exhibition in Paris, receiving a bronze medal in the Artistic Furniture category (U.S. Congress 1901), and is listed as winning a bronze medal from the Department of Varied Industries in the 1902 Report of the New York Universal Exposition Commission (Documents of the Senate of the State of New York 1902), presumably for his revolving bookcase. But he liked to eat

frogs, and the booklet noted that he was concerned about the lack of a ready supply.

Bierbrier extolled the virtues of frog raising, stating that frog farming involved “light work” and thus was amenable to persons who were unable to do hard manual labor. Like Coombes’ (1902) booklet, Bierbrier’s uses a narrative format to commend the potential of frog farming and advise on the methodology of constructing ponds and rearing frogs. And as with Coombes, Bierbrier’s advice was based on his experiences raising frogs at his New Jersey farm. For example, he noted that adult frogs could be fed by soaking potato or feed bags with molasses and fastening them around the ponds just above the ground to draw flies and presumably other insects.

No doubt Bierbrier was raising American Bullfrogs (he noted that bullfrogs and spring frogs [= *L. pipiens*] were eaten in America), but he was clearly confused in nomenclature. He states “Two species of *Rana* are common in America and Europe, viz., *Rana esculenta* and *Rana temporaria*. The latter alone is indigenous to Great Britain, and varieties of it extend throughout temperate Europe and Asia to Japan, and one variety (*pretiosa*) exists in the United States.” He includes an illustration of the edible frog (*R. esculenta*, = *Pelophylax esculentus*), and notes that frog farmers should procure “the edible frog of Great Britain.” At the end of the booklet, he stated that he always had breeding stock available, with 4-year-old frogs selling at \$4.00/pair, and 5-year-olds at \$10.00/pair, a considerable amount of money at that time. There is no indication that Bierbrier actually imported breeding stock from Europe, as no European ranids have been reported from New Jersey.

The third privately published manual that we are aware of is published by H. G. Santen (1912) in Monterey, California (Fig. 7). Henry George Santen (14 November 1870–25 February 1917) was born in Dusseldorf, Germany. He subsequently moved with his family to Paris, France, where he apparently gained an appreciation for eating and raising frogs, and eventually received training as a nurse. He immigrated with his older brother to the U.S. in 1896 and settled in New York City where he and his brother subsequently enlisted in the U.S. Army in 1897 just before the outbreak of the Spanish American War, and both rose rapidly through the ranks. Santen was eventually discharged in 1900 with the rank of Sergeant Major. He then embarked on a career as a civil engineer and worked overseas in the Far East for a number of years. He eventually settled in Monterey, Monterey County, where he continued working as a civil engineer on various construction projects at the Presidio in town. It was here that he wrote out his manual (which was probably inspired by recent articles on “French Frog Farms” in the newspapers) and had it published locally. However, it is merely a proposal on how to raise frogs from Europe based on French publications and includes nothing regarding American Bullfrogs.

Soon after Santen published his manual, he married a local divorcee and moved to Oakland, Alameda County, California where he worked as a draftsman and civil engineer. He did no further research on frogs and died suddenly in Oakland at age 46 from angina pectoris.

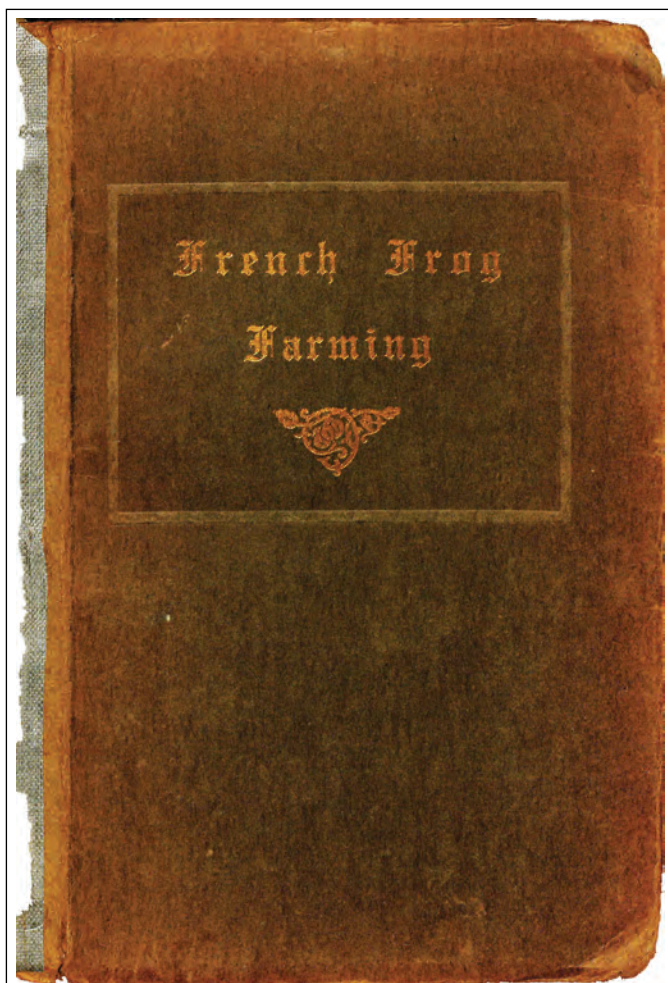


Fig. 7. Cover of *French Frog Farming* by H.G. Santen, 1912. Courtesy of the California State Library, Sacramento.

Apparently no one followed up on Santen's suggestions until 1923 when local capitalist, civic leader, and floriculturist Harry Ashland Green (12 January 1858–13 November 1933) had his neighbor Francisco Cossio Swain (24 July 1866–6 May 1945) import one dozen live "French Frogs" from Europe to liberate into the garden pond on his property on Lighthouse Avenue in Monterey. Swain was a native of Spain and immigrated to the United States in 1889. Although he started out as a photographer in Monterey, by 1920 he was a dealer in the city's fish market and certainly knew how to go about importing live frogs from Europe. Unfortunately, there is no record of the meager number of frogs they liberated having survived. A 1925 newspaper article notes them observing the pond "packed with wriggling tadpoles" (Anonymous 1925). Presumably, the tadpoles later turned out to be those of anuran species native to the area.

We can find only one additional manual on raising frogs prior to the 1930s, that of Randel (1914; Fig. 8). Walter Augustus Randel (27 September 1874–21 May 1945) was born and raised in Jersey City, Hudson County, New Jersey and originally was a travelling salesman. He is thought to have also been a producer of milk products in Seymour, New

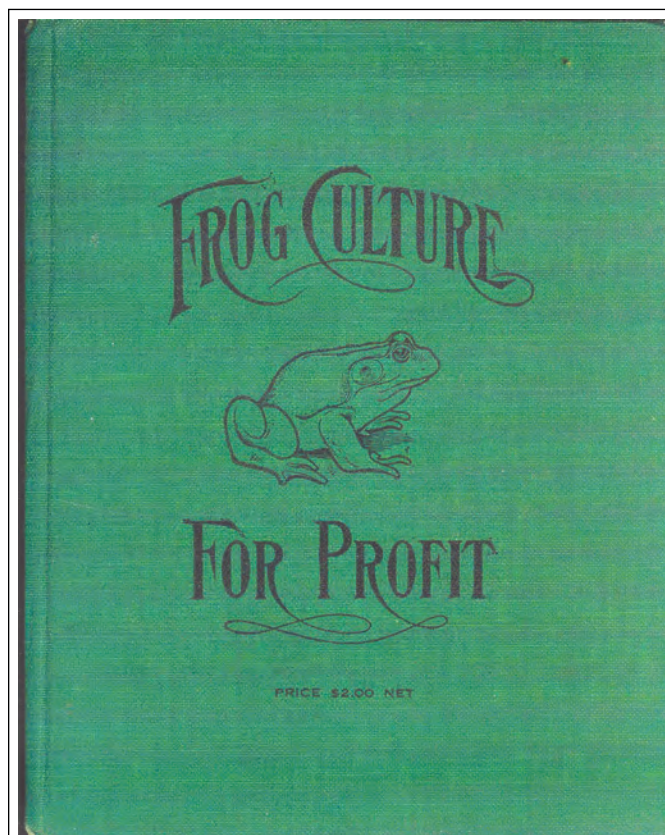


Fig. 8. Cover of *Frog Culture for Profit* by Walter A. Randel of Seymour, Connecticut, 1914. Randel's name does not appear on the publication. The attribution comes from the Library of Congress where Randel is listed as a contributor "from an old catalogue." The booklet was copyrighted by Randel in 1914. See Catalogue of Copyright Entries for 1914, Volume 11, Part 1, Books, Group 1, p. 4929.

Haven County, Connecticut. Around 1909, his marriage failed and he subsequently remarried and started a new family in Seymour, after the divorce of his first wife. They later settled in New York City where Randel worked as a salesman for the major gelatin and glue manufacturer Thomas W. Dunn Company. Concurrently, he also attempted to start a business by selling his manual. He published advertisements in many major American newspapers in 1914 requesting individuals contact his company Aqua Life in Seymour if they were interested in pursuing a new career raising and selling American Bullfrogs. He also apparently traveled overseas to England in 1915 to interest others in either buying his book or publishing copies under license. It's also possible that he was making contacts in England for potential sales of glue products which were in high demand during World War I.

This is a rather short, narrative publication that sold for \$2.00. Although >60 pages in total, the type is large and only every other page has text (on the right side), with a single illustration of a small frog on the facing page. Information is presented in a narrative format in green type, and there are a number of greenish photographs of (presumably) the author's farm and operations. The booklet borrows freely from



A. Broel

President and Founder of the A. F. C. C.

Fig. 9. Albert Broel as a young man. This photo is reprinted in many Broel publications.

previous federal and state information leaflets, but the author does not provide any information on his personal involvement with frog farming.

Interestingly enough, at least one individual was reported to be selling this same publication according to a letter received at the U.S. Bureau of Fisheries in 1923¹. Apparently, John Pennoyer Hoyt (7 May 1858–15 March 1933) was selling a hard copy book with the same title for \$2.00 (which he probably purchased from Randel in bulk at a discount). He was a rice farmer, Justice of the Peace, and a Notary Public, in Estherwood, Acadia Parish, Louisiana. He apparently systemically collected and sold frogs from local marshes for sale as needed. He also published several small magazine and newspaper articles and sold American Bullfrogs from his “Frog Park” for breeding and commercial purposes.

Although Randel had a successful career as a glue salesman throughout the 1920s and he continued to own his Seymour farm after his retirement, there is no evidence that he actually farmed or sold bullfrogs for a living. He eventually died in New York City.

ALBERT BROEL AND THE AMERICAN FROG CANNING COMPANY

Whereas the Great Depression stimulated interest in frog farming by federal and state agencies, the juggernaut initi-

ated by Albert Broel (a.k.a. Count Albert Broel-Plater, 12 August 1888–23 October 1967; Fig. 9) propelled interest in frog propagation far more than all government agencies combined. Broel was a unique entrepreneur. He was born in Warsaw (now located in Poland), of Polish and French parents and grew up in what is now Lithuania, then part of the Russian empire. His family was considered minor nobility at the time, and they had an estate where his mother (a native of France) kept frogs for the dinner table. According to Broel (2007), Albert became fascinated by frogs through his mother’s interest. He took a medical degree at the University of Warsaw, then served in the Russian cavalry during World War I and was wounded and captured by the Germans in one of the very first battles of the conflict. Following a daring escape with the help of a cousin, he came to the United States in 1915, settling in Lansing, Michigan. With the U.S. entering the war on 6 April 1917, Broel soon got a job training new officer recruits in the art of soldiering at Fort Sheridan, Illinois. He later joined the U.S. Army, but was discharged after only a month of service due to his recent immigrant status. Later, in March 1918, he was able to rejoin the Army as an intelligence officer for the rest of the war and became a naturalized U.S. citizen in 1918 based on his military service (due to recent Congressional legislation).

Following the armistice, Broel worked at a number of jobs for short periods of time. These include being a machinist in Lansing, a clerk in Racine, Wisconsin, and a construction engineer in Chicago, Illinois. It is also at this time that the first of a series of articles in local newspapers appears in 1920 with what was to become a hallmark of Broel’s later advertising. That is, a story of him going to be rich from something that he discovered, the inclusion of a few factually correct statements, and then the pronouncement of things he has done, or about to do, that are a total fabrication. As with all of Broel stories, they got better as his language skills improved and the stories were refined and retold.

It is also at this time that Broel has his first brush with the law. Interestingly enough, he was investigated by the Federal Bureau of Investigation in 1923 for claiming to be an agent of the United States Government. He was fortunately exonerated by one of his former military colleagues who attributed it to his “broken English” and a misunderstanding by the other party.

Broel (2007) gives a discussion about her father’s early years and the major struggles to start a family. Because of financial constraints, he decided to attend a non-traditional medical college where he earned a degree in naprapathy, a wellness practice based on a belief that diseases are caused by connective tissue and ligament disorders, the treatment of which is by massage therapy.

Soon after, he moved to Detroit, Michigan, got married, and set up a practice in naprapathy. The practice was initially successful and Broel purchased a number of pieces of real estate, including a large house and an apartment complex in the eastern part of Detroit (Gross Pointe Village) which he

later depended upon for income. He also started a factory that made cosmetics and eventually acquired a 45.5 ha farm in Fremont, Sandusky County, Ohio in order to pursue his obsessive hobby, frog breeding.

The 1920s were a time of ups and down for Broel. His first wife died in 1924 after the birth of their child, a son who was later adopted out to another family. Only 3 months later, he married for a second time, a recent divorcee. Their marriage also ended in divorce in 1928, but they later reconciled. It is also at this time that he and his wife (along with her mother) apparently ran a secret matchmaking dating service called the “American Friendship Society” while Broel practiced his medical trade. Although set up as a non-profit entity, they did charge a fee for their services, which included sending correspondence through the mails to introduce men to compatible women, as well as arranging marriages.

All seemed well until the Broels returned to the United States from a trip to Europe on 3 August 1931. At the end of the month, local and foreign newspapers exploded with the sensational story of one of the members of the American Friendship Society murdering women and children that he initially solicited through this club. Thus, in a single stroke, the Broels’ portraits and names were prominently featured on the front page of many newspapers across the nation. Even a photograph of their fashionable house was shown in some newspaper articles. The newspaper stories ran for days afterwards and the publicity for the “self styled Doctor” was such that it wasn’t good for any of their businesses, let alone living in Detroit.

Eventually, with the help of good legal representation, the Broels were cleared of any wrong doing by the local postal inspectors, as well as the district attorney. However, as pointed out by Broel (2007), all the negative publicity caused his practice to be eventually closed down and he was fined for practicing medicine without a license (since he did not have an M.D. from a suitable university that was approved by state and local officials). The final straw came after Broel was found semiconscious on 27 February 1932 in a ditch near New Baltimore, Michigan, after being robbed and his car set on fire. He had been kidnapped in the driveway in front of his house and been previously told to get out of town by phone calls and letters, and now physical threats. Thus, the Ohio farm that he and his wife had frequently traveled back and forth to in order to escape the chaos of the city life, became the Ohio farm where Broel would develop methods of breeding frogs on a large scale, such as by damming a spring and digging breeding ponds.

Broel and his wife moved to Fremont, Ohio, in March 1932 and lived at 400 Harrison Street. He subsequently set up the headquarters for American Bullfrog Industries at 1458 West State Street (later moved to 1606 West State Street), ordered some bullfrogs from the south (probably New Orleans), and started experimenting with how to raise frogs, as well as canning frog meat. On 27 February 1933, he proudly reported to local newspaper reporters that he was now in the

frog canning business. Just like with his earlier newspaper statements in 1920, it was to be a money-making operation with little factual supporting information. Purportedly, he would be raising 3 million bullfrogs per year on his ranch, which was located about 6 miles northeast of town (near what is now the hamlet of Upton in Sandusky County). The ranch would also be the site of a large frog canning facility.

Soon after this pronouncement, he became acquainted with an individual named Sylvester Lawrence Schutt (31 January 1912–2 November 1999), the son of a local farmer in Madison Township, Sandusky County, Ohio. Schutt was a 1929 graduate of Fremont High School and started out his career as an electrician for a local power company (after apparently attending trade school for 2 years). However, his job evaporated during the Great Depression and upon becoming acquainted with Broel, an entirely new career was born—that of an advertising agent and salesman.

Schutt seems to have been tailor-made for Broel. His youthful energy, knowledge of how to keep a farm running, command of the English language, writing abilities, and connections with the local community all helped in starting a frog farming business that later became known as a “giant failure” (see Laskow 2017). Apparently, Schutt was responsible for keeping the “frog farm” northeast of town running and publicly he was considered the “Manager” of the company. However, on less public documents, he stated his profession as “writer.”

Schutt is listed as author of some of the earliest publications of what became to be known later as the American Frog Canning Company (e.g., see Schutt 1934). He almost certainly assisted Broel with putting together the slick promotional materials, advertising brochures, frog raising guides, and posters that became the hallmark of the company. It was also these brochures and frog raising guides that Broel and Schutt sold to potential investors that signed up for his bullfrog culture lessons at their “school” in town.

From the beginning, everything that Broel sent out from his office attempted to highlight the novelty of the enterprise. This even included the company letterhead that stated “First Industry Of Its Kind” and “Originators of “CANNED” Frog Legs And Boneless Frog Meat.” It also included the Broel coat-of-arms that would be featured on many of his later publications.

By April 1933, however, Ohio State inspectors had decided against licensing American Bullfrog Industries for operation of its canning plant within the City of Fremont. Further, the State Inspector described Broel as “a dreamer” since the company had not produced a single can of frog meat and there is no chance of obtaining enough frogs in the future to support such an enterprise.

Given the above rulings, Broel next decided to move his operations to a new location. He probably focused on New Orleans, Louisiana, based on his previous experience with dealers there and the large source of wild bullfrog stock that could be used for canning. Thus, Broel and Schutt purportedly left

Fremont sometime after August of 1933 with \$15,000.00 in checks from the sale of their instructional brochures and headed to New Orleans. They soon set up their operation at 531 Metairie Road and began the process of re-building the business. One of the first things they did was rename the enterprise to the American Frog Canning Company. Upon visiting the establishment at 531 Metairie Road on 3 January 1934, U.S. Bureau of Fisheries employee John Cleary Pearson (23 February 1902–14 September 1989), acting incognito, met with “Mr. Schutt” (who actually was Broel). He reported that Broel then had no farm, expected to start one in the spring, had cans of frog meat on hand, but reported difficulty in getting a supply of frogs. Broel stated that he would buy frogs over a certain size (which turned out to be the maximum for American Bullfrogs) and reported that frogs were shipped from New Orleans to Germany on 1 December 1933 and arrived safely.

After perfecting a method of canning frog meat and getting more investors involved, the business eventually started to take off. Broel then bought 5.5 ha in Jefferson Parish to develop into a frog farm and processing plant. Opened in March 1935, the new quarters at 3800 Jefferson Highway were apparently an imposing set-up. According to Bureau of Fisheries employee Albert Steele Young (22 July 1904–15 July 1983), “the office building is a dazzling white stucco structure, with its simplicity accentuated by green lawns, white picket fences, and clam shell driveways. Across the front of the building is a raised gold sign proclaiming that this is the “American Frog Canning Co., Cannors of Frogs and Frog-legs a La Queen.” Several highly colored coats-of-arms set in the stucco add to the impressiveness of the building. Flanking the entrance are two huge white replicas of bullfrogs done in concrete or stucco with large pink electric light bulbs for protruding eyes.”

Inside the complex was a series of 4 or 5 earth walled ponds, about 100 feet square, that were separated from one another by board fences. Some of the ponds contained hundreds of large bullfrogs bought on the open market, while others contained freshwater turtles. One pond contained a number of American alligators (*Alligator mississippiensis*) of various sizes. These were apparently for attracting customers to visit the facility, rather than for cleaning up the refuse and carcasses of the frogs butchered for canning.

Behind the ponds in operation were a series of small ponds and ditches. They were purportedly used as rearing ponds for tadpoles, mosquitofish (*Gambusia* spp.), and Louisiana red-swamp crayfish (*Procambarus clarkii*). Finally, and most importantly, adjacent to the facility was a water works structure that Broel also leased land to. This became an important component of the frog farm as he received free water and rental income.

The whole operation was meant to impress and create the idea that one might actually make a living by raising and selling frogs. However, there is no evidence that any frogs were actually raised or fed at the facility. Instead, wild frogs were repeatedly bought, the ponds stocked, and then the frogs were harvested and sold (or canned), as needed.

An important component of the operation was to sell frog raising lessons and breeder stock to the general public via brochures. Broel made sure to allow for free access of the grounds and not have any tour guides. Instead, he had a number of young women in the office (none of which knew anything about frog culture) ready to hand out brochures and other materials as part of their secretarial duties. He also is reported to have offered commissions to anyone who signed up a paying customer for lessons or breeding stock.

From this location, Broel eventually ran a four-fold operation: holding adult frogs for domestic and international (e.g., Hince 2011) sale for stocking farms, selling fresh and canned frog meat, selling frog-farm plants and supplies, and instructing would-be farmers in how to raise frogs. He also started to branch out into other business ventures such as selling baby turtles (largely Red-eared Sliders (*Trachemys scripta elegans*)) and Green Anoles (*Anolis carolinensis*) through the mail.

The first challenge to the business was not to come from disgruntled customers. Rather, it came from a totally unexpected source—local entrepreneurs who wanted to cash in on the frog farming craze. Since Broel and Schutt had only registered their company name in the State of Louisiana, and had not incorporated it (Broel 2007), a group of 3 local businessmen suddenly formed the American Frog Canning Company, Inc., in 1934 and opened their office on the 3rd floor [=Room 324] of the Godchaux Building at 527 Canal Street in downtown New Orleans. Composed of a former real estate agent [Heber Wallace Regal (23 March 1870–14 December 1938)], retired life insurance salesman [William Dalton (6 May 1862–2 June 1936)], and an out of work Master Mariner Graden Luther Forrest [(13 November 1898–25 June 1967)], they attempted to have Broel pay them for the privilege of using the name of his own company. This resulted in a year-long court struggle in which Broel’s legal team eventually prevailed (Broel 2007).

By then, complaints from earlier investors in Fremont were starting to come into the local offices of the better business bureau and postal authorities. The statements of the Post Office Inspector for Fremont (in the files of the U.S. Bureau of Fisheries and extracted on 15 May 1937 by Tracy Irwin Storer¹) are telling: “American Bullfrog Industries, [now at] 302 Croghan Street. Advertising states that: Course on frog production sells for \$47.50 to \$57.50. Six breeders should produce \$3,000–\$5,000 in 2 years in pond 10 by 20 feet; tadpoles 1 year \$0.15 each, younger \$0.05 each. Tadpoles become table size frogs in 2 years, hence income \$1,200 per pair. Has market for 1 million frogs per day. Can make bullfrogs transform in 6 months. Albert Broel, then of above address, had 2 room office and nothing else.”

“Has ascertained that Mr. Schutt=Broel=Dr. A. B. Plater. The real Sylvester Schutt is a farmer boy about 23 years old employed by Broel in office work; he knows no biology, but his name was used by Broel on much of the printed matter. Inspector believes that Broel does not have a frog farm in Ohio; a farm purchased here reverted to the owner as Broel

left just before a suit in the Justice Court. It is reported that he erected some wire net on a natural frog marsh on this area but that there are no “giant La Frika” there [=Louisiana + Africa, alleged cross; no evidence of African frogs or of cross.] Circulars sent to 200 persons known to have made remittances to the enterprise at Fremont; many replies; one individual bought land and invested \$900 in facilities” (14 February 1935 letter from Postal Inspector).

“Many persons entered complaints against Broel, et al. under section 2350, Postal laws and Regulations. Secret indictment to Federal Grand Jury, September 1935, against S. Schutt, A Broel, and the two companies” (7 October 1935 letter from Postal Inspector).

By then, the American Frog Canning Company had flooded many newspapers and magazines around the country with small ads that seemed to guarantee that the average person could make money growing American bullfrogs in small ponds in their backyard lots and selling them to local markets. Such efforts resulted in many people requesting further information and often purchasing lessons and “breeding stock.” Because of the excessive and unsubstantiated nature of the claims in their promotional materials, Broel and Schutt first had to deal with the Federal Trade Commission. They subsequently agreed on 24 April 1936 to a cease-and-desist order from the Commission (FTC 1939) whereby they acknowledged that eight claims they had made in advertising their frog farming course had no basis in fact. Although that settled issues with the Commission, there were other legal issues to deal with from disgruntled investors as a significant number of people had now lost money and demanded legal action. Thus, Broel and Schutt were next arrested in New Orleans on 17 June 1936. They were given temporary bail, subsequently posted \$2,500.00 bonds each on 6 July 1936, and ordered to appear in a Toledo, Ohio court to answer charges of using the mails to defraud the public. Although they had been indicted for fraud by U.S. Postal authorities in December 1935, the charges were eventually dropped due to a legal technicality successfully argued by Broel and Schutt’s legal team. However, that didn’t stop a Federal Grand Jury from re-indicting them on 10 September 1938. Thus, Broel and Schutt returned to the Toledo court on 20 September 1938 where they posted \$1,000.00 bond. By then, Broel apparently made a shrewd business decision to sell out while the property still had value and move back to Detroit where his wife would be happier. His recently developed heart condition may also have been a factor (Broel 2007), as well as the inability to buy enough wild frogs to fulfill orders and keep the cannery operating (Broel 1950). Eventually, Broel and Schutt’s legal team prevailed once again and they did not have to pay any restitution to former customers.

As for Schutt, he moved his family to Toledo, Ohio in 1938 where he continued his career as an advertising clerk for the Lane Drug Company. He eventually retired to Winter Haven, Florida where he died in 1999.

In retrospect, the American Frog Canning Company was a failure in the aspects of raising frogs, providing advice on



Fig. 10. Cover of the spiral bound 1943 edition of *Frog Raising*, Marlboro House, Detroit. Other copies are dated 1944 or 1945, but the text is identical.

how to raise frogs for making money, and canning frog meat for profit. However, the business and associated ventures have to be considered a success if one views it to be a roadside theme park that used frogs and other animals to bring people in to spend their money and also as a depot to hold wild bullfrogs for sale as needed.

Broel subsequently pieced together information, which he named The Broel System, into a booklet (1937a), a spiral bound book (1943; Fig. 10), and a hard cover book (1950; Fig. 11) that is probably the best known “how-to” manual on frog farming and marketing. Although copies of the spiral bound and hard cover books exist with various dates, the text and content remain identical. All the books and promotional features included many black and white photographs illustrating various aspects of the frog industry. These photos were used repeatedly in nearly all publications, and were often reprinted in other manuals (e.g., Florida Department of Agriculture 1936, 1952).

Memorabilia from Broel’s American Frog Canning Company are extensive. They include brochures, flyers, promotional booklets (Fig. 12), and newspaper and trade magazine advertisements in addition to the later books. The booklets and promotional material often have different covers and dates, but the internal content remained basically the same: a great business (“A Fascinating Industry For Women Too”),

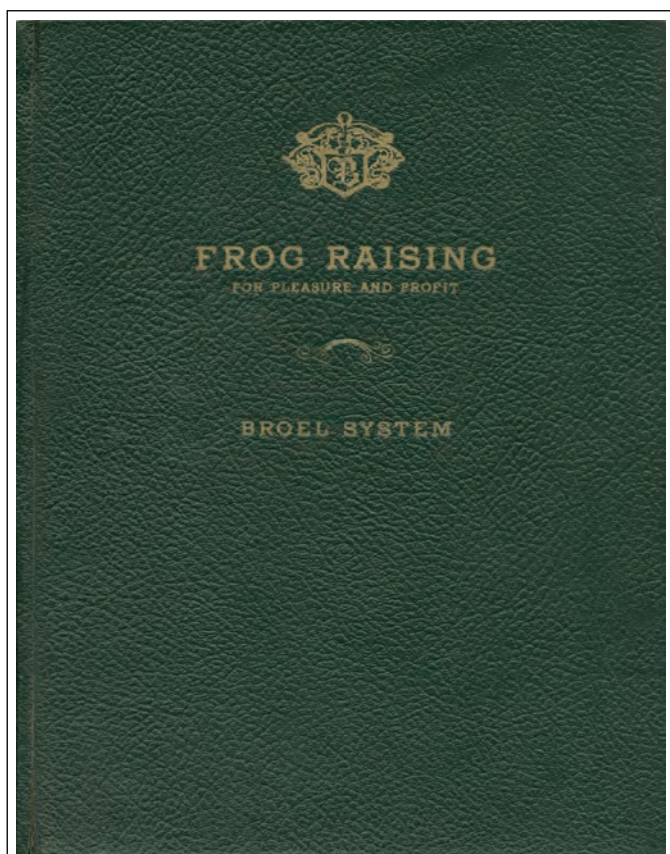


Fig. 11. Cover of the 1950 edition of *Frog Raising for Pleasure and Profit*, Marlboro House, New Orleans. Other copies are dated 1951, 1953, 1954, or 1960, but the text is identical.

a fortune to be made with little investment, ease of propagation, a great market, we buy frogs legs (he even offered a \$20 no-interest loan to farmers until they shipped frogs to him; Figs. 13, 14), testimonials, and a promotion of The Broel System. The Broel System course featured 16 booklets and supplements covering every aspect of frog raising and marketing. The booklets range from 6 to 18 pages and were issued roughly monthly. The cost for the course ranged from \$47.50–\$57.50 depending on payment plan, and included 5 pairs of “Nufond” Giant Bullfrog Breeders.

The Broel System lessons were typescript with green or white colors (Fig. 15). Lesson 1 (History of the Frog Industry) was issued in 1934; Lessons 2–7 (Possibilities of Frog Farming, Getting Acquainted with Frogs, Where to Make your Pond, Digging your Pond with the Broel System, Making your Pond hold Water, What the Pond Should Contain) were issued in 1935 (Broel 1935a–f), and Lessons 8–16 (Caring for Tadpoles, Raising Food for Frogs, The Breeding Season, Caring for Baby Bullfrogs, Raising Food in Large Quantities, More Feeding Systems, Feeding Frogs for the Market, A large Commercial Bullfrog Ranch, The Frog Market) were issued in 1936 (Broel 1936a–i). Supplements were issued in 1936 (Vegetation, Before Breeders Arrive) (Broel 1936 j–k) and 1937 (Worm Culture) (Broel 1937b). A 1937 catalogue (Fig. 16) continued to offer a large array of frog farming equipment, including plants, fencing, breeders, frog farm supplies, and canned meat (Broel 1937c). The catalogue cover letter was optimistic, despite the fact that Broel would shortly sell the farming business.

After giving up the frog production business, Broel concentrated his efforts on promoting The Broel System. He also apparently continued to handle frogs as a middleman in sales (Broel 2007). His 1943 and 1950 books incorporate the lessons from The Broel System course, with added photographs and much better-quality printing, but without the promotional hype. Even into the early 1960s, Broel was still being asked about his opinions about frog culture (Heilman 1963)—his answers always repeated the now familiar statements in his books.

Albert Broel eventually died of complications from a stroke in New Orleans in 1966. By his sheer promotional energy, he influenced many frog farming attempts, and caused the U.S. Bureau of Fisheries and the Postal Service to keep an eye on as many of these operations as possible. Perhaps the most telling effect was some of the popular radio comedians of the time using the phrase “not-raising-hog-business” for anyone involved in commercial frog culture (Anonymous 1935a). However, as pointed out by Schmidt (1935), a large amount of money had been made in frog farming by the sale of a booklet or pamphlet of directions for raising frogs on backyard lots. Certainly Broel was not the only one induced to produce ‘how-to’ manuals in the 1930s.

OTHER 1930s PUBLICATIONS

In the early 1930s, many publications appeared extolling the new industry of frog farming. The manuals were of varying length, quality, and usefulness, but they generally followed the same topics as those of previous state, federal, and private manuals. Perhaps the most frequently cited is that of Ruffner (1933; Fig. 17) of Southern Frog Farms in Jennings, Jefferson Davis Parish, Louisiana, where frogs were raised on a 36.4 ha tract.



Fig. 12. Three promotional brochures from the American Frog Canning Company. The titles and formats are slightly different, but the contents are essentially the same. Left to right: 1934, 1935, 1938.

Benjamin Merle Ruffner (25 July 1896–22 July 1987) was a native of Mowlagua, Illinois and moved with his parents to Jennings, Louisiana, as a small boy where his father operated a farm. Ruffner remained in Louisiana until he was a teenager and then moved to Houston, Texas. He was a student at Port Arthur College in Port Arthur, Texas when World War I broke out. He subsequently served in the U.S. Army during the war and worked as a clerk and stenographer in Colorado, Utah, and Texas during the 1920s. He and his wife also operated a potato chip factory (Ruffner Products Company) in Port Arthur City, Texas in 1929.

Ruffner apparently became involved with frog farming on his parent's property in 1931. For 4 years he conducted extensive experiments on how to raise frogs for market. He purportedly spent \$12,000.00 during this time period (5 April 1936 letter from Ruffner to the Bureau of Fisheries, Washington, D.C.¹).

His booklet, which was priced at \$1.50 per copy, provides extensive practical information on frog farming based on his experiences and experiments raising frogs. Frog farming seemed like a good idea, as Ruffner noted that 300,000 bullfrogs were shipped from Louisiana in the first 6 months of 1932, after a 1931 total of more than one million. As with some other booklets from that era, Ruffner combines information on collecting bullfrogs from the wild with propagation. Still, he was quite realistic in his assessment of the industry, unlike Broel, noting that there was a high rate of failure in frog farming due to lack of capital investment, the time involved coupled with inexperience, and difficulties in feeding a large number of bullfrogs with live food. The manual he produced is entirely in narrative format without photographs or illustrations.

Ruffner had sent a typescript revision of his 1933 publication and, after the experimental Ranarium was abandoned and the work brought to a close in 1934, offered to sell a copy of a final revision of his treatise (under a different title and based on the final results of the experiments) to the U.S. Bureau of Fisheries for \$5.00 a copy. Apparently, nothing further happened with this work and he abandoned his career as a writer after 1936. He subsequently started a successful metal manufacturing shop (Metal Craft) in Houston, which he ran until his retirement.

The Chariton Corporation (a.k.a., Chariton Fur and Frog Farm Inc., Chariton Fur Corporation) of Chicago, Illinois,

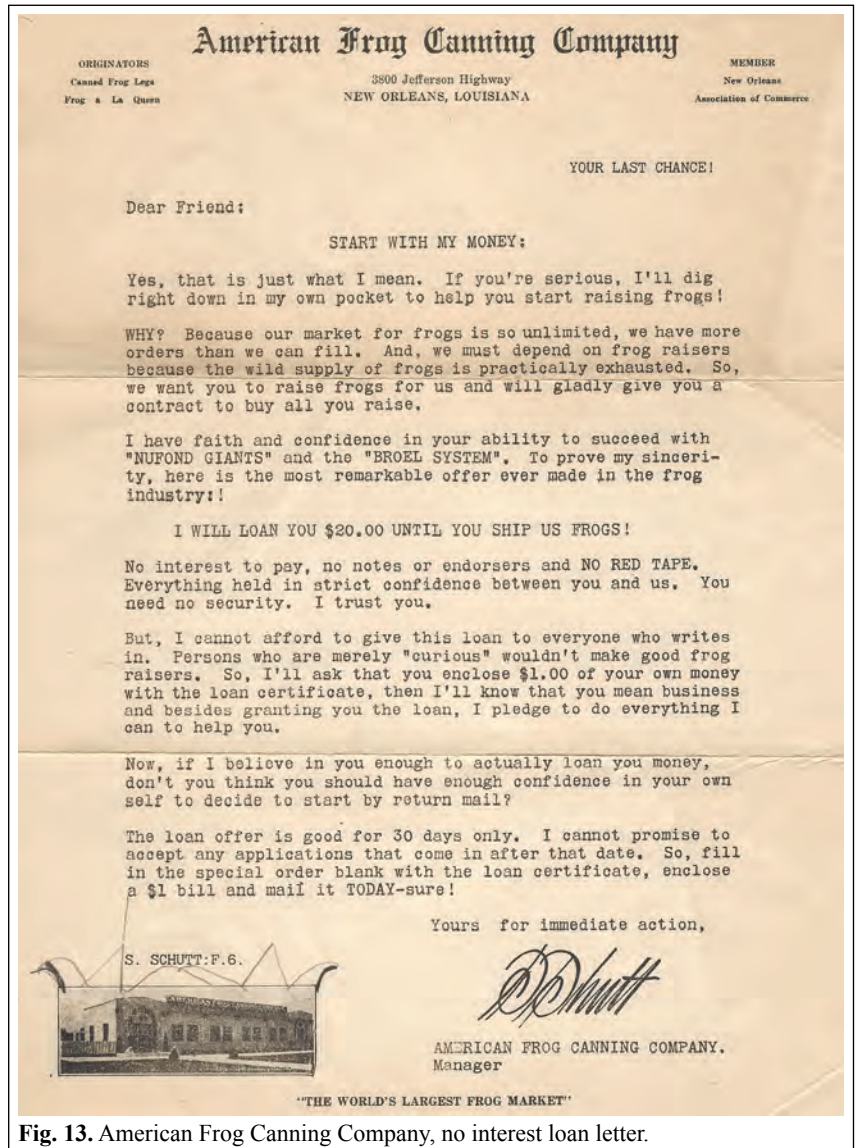


Fig. 13. American Frog Canning Company, no interest loan letter.

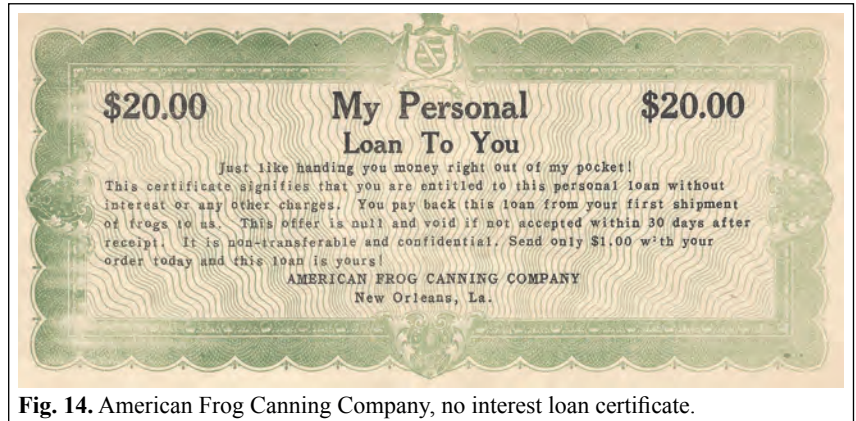


Fig. 14. American Frog Canning Company, no interest loan certificate.

produced two booklets on frog farming, one under the authorship of Martin Henry Fenton (1932) [at \$2.00] and one by W. L. Hannaca (1933). An undated 1928 booklet (Fig. 18) appears to have been written by Fenton prior to his association with the Chariton Corporation; this booklet combined

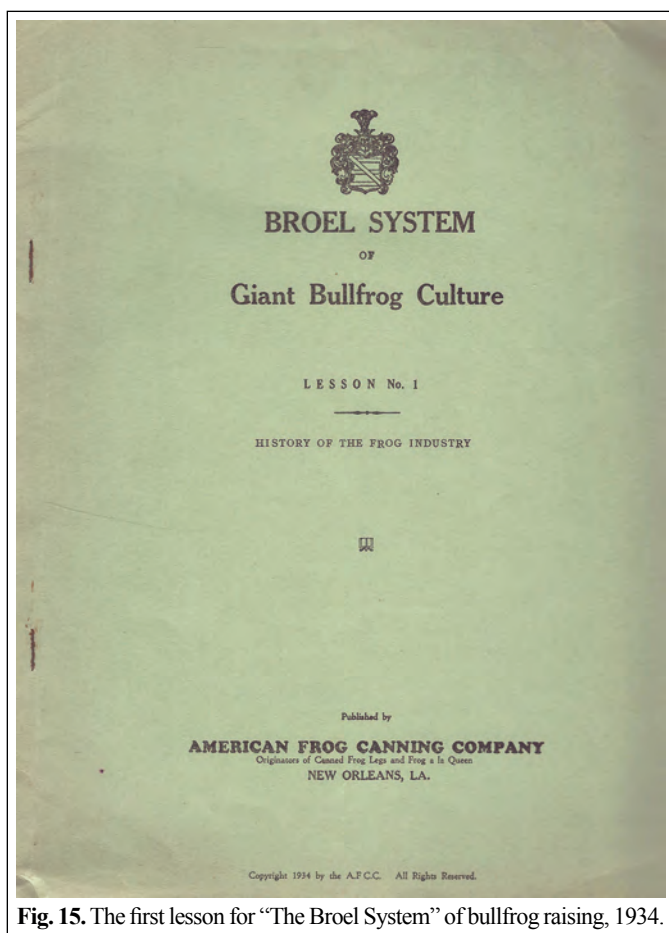


Fig. 15. The first lesson for "The Broel System" of bullfrog raising, 1934.

information on frog and muskrat (*Ondatra zibethica*) farming, and is the only frog farming manual directed particularly at a Canadian audience.

Martin Henry Fenton (22 April 1880–?? 1966) was a native of Waubesa, Simcoe, Ontario, Canada where his father worked as a laborer in the sawmills and as a fisherman. He subsequently worked at a variety of jobs including being a cook and a summer hotel keeper before becoming interested in muskrat farming (something others did where he lived in the region of Pickerel, Parry Sound District, Ontario). By 1930, he had focused on farming frogs, which were popular among Canadians (Sibley 1912). His association with William Logan Hannaca (23 August 1880–7 December 1966) probably stemmed from the latter's work as a buyer and seller of frogs (Giant Breeders, small frogs, tadpoles) and water plants using a Chicago address, later the address of the headquarters of the Chariton Fur Corporation.

Hannaca was a salesman, businessman, and president of the Chariton Corporation, mayor of Glasgow, Howard and Chariton Counties, Missouri, and operator of the Hannaca Poster Service among other business interests. In 1930, Fenton (whose occupation was listed as "frog culture" on passenger manifest documents) traveled with his family from Ontario to Forest Green, Chariton County, Missouri, to join a friend. Since Forest Green is located just north of Glasgow,

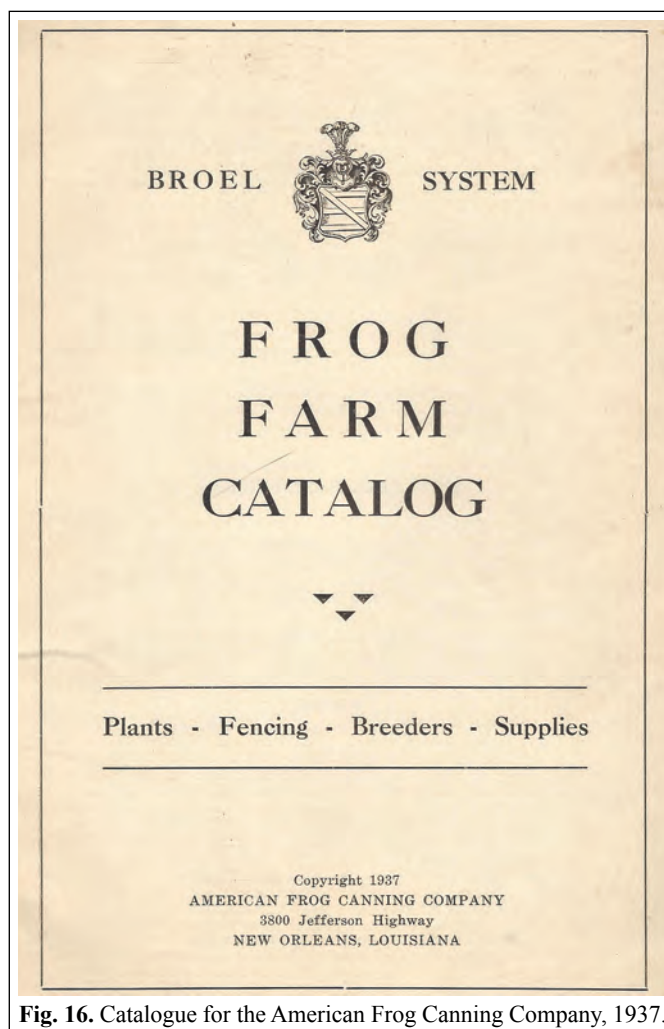


Fig. 16. Catalogue for the American Frog Canning Company, 1937.

presumably the friend introduced Fenton to Hannaca due to their mutual interests in frog culture. Thus, Fenton's presence in Missouri from May–August 1930 provided plenty of time to discuss their mutual experiences regarding frog farming (in Ontario versus Missouri) and put together a business plan for their corporation.

The Fenton booklets consist mostly of narrative with a few line drawing illustrations for aesthetics. On the other hand, *The Frog Industry* (Hannaca 1933; Fig. 19) is a well-produced book providing extensive information on the frog industry. Some information appears borrowed from other manuals, but much is new, for example, information on raising frogs, building a tadpole pen, an extensive discussion of plants to include, the use of floating minnow rafts and a "roly poly and fly trap feeder" to provide live food, and the application of quick-freezing to preserve the perishable meat, an application that had recently been introduced to food processing by Clarence Birdseye (9 December 1886–7 October 1956). The book includes line drawings to illustrate the new feeding techniques and black and white photos of a large Wisconsin frog farm provided by an unidentified customer. Unlike any other manual to date, Hannaca included an extensive glossary and provided an index to its subjects.

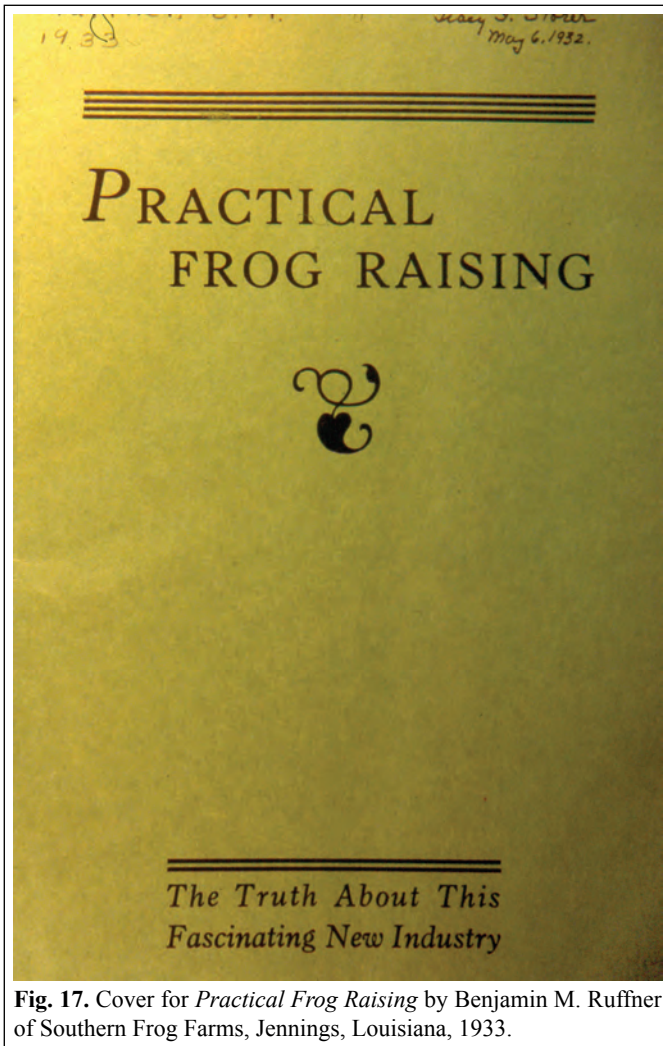


Fig. 17. Cover for *Practical Frog Raising* by Benjamin M. Ruffner of Southern Frog Farms, Jennings, Louisiana, 1933.

Both Fenton and Hannaca seem to have fared poorly during the Great Depression. The price and demand for furs dropped dramatically as the economic crisis continued, while there was never a greatly increased market or high price paid for frog meat. Thus, by the beginning of World War II, both individuals were 60 and had moved on to other trades for a living.

The only “how-to” manual written by a professional biologist is that of Paul Percy Viosca, Jr., (24 June 1892–27 August 1961), founder of the Southern Biological Supply Company (SBSC) in New Orleans (Fig. 20). Viosca spent much of his career working off-and-on with the Louisiana Department of Conservation on a variety of species, spending most of his time doing fieldwork throughout the state (see Adler 2012). He is also one of the first biological consultants to be hired by private industry. A prolific writer and naturalist, he authored the state information bulletins on frog farming (Anonymous 1931a, 1935b) according to a note in Storer’s files, although he is unaccredited in official bibliographies of his work (e.g., see Penn 1962). Viosca noted that he had become interested in the potential of commercial frog farming in 1915, and began experiments in methodology in 1917 (Viosca 1934). He

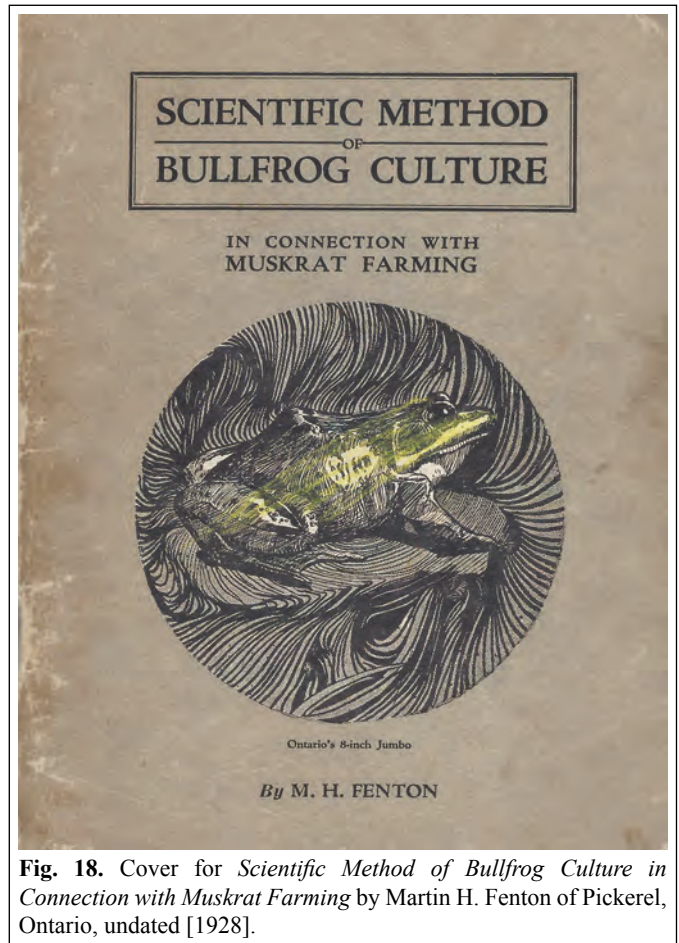


Fig. 18. Cover for *Scientific Method of Bullfrog Culture in Connection with Muskrat Farming* by Martin H. Fenton of Pickerel, Ontario, undated [1928].

published his first frog culture paper under his own name in 1931, copies of which were available through the American Fisheries Society secretary at \$3.00 a copy.

In 1934, Viosca wrote *Principles of Bullfrog Culture* (a reprint of Viosca 1931) under the auspices of the SBSC that gave detailed information on the biological and technical requirements of frog farming, including incorporating rice fields into production, and noted the differences between ranching and intensive farming. Rather than the muskrats of Fenton, Viosca noted the potential to farm both frogs and Louisiana red-swamp crayfish, a major source of income in Louisiana, simultaneously. His booklet provided detailed diagrams of a flow-through water system to help prevent disease and yield multiple crops, a parallel trenched bullfrog rearing pen he designed, and water plants. He also gave detailed instructions for the construction and operation of what he called his ABC system of intensive frog culture, ABC referring to the order of pen construction allowing the cultivation of bullfrogs, Green Frogs, minnows (*Gambusia* spp.), and crayfish. Illustrations were supplemented by many black and white photographs.

In May of 1931, Milo Whitney Herriman (5 November 1897–23 July 1946), formerly of River Forest, Illinois (not Michigan as reported in some articles), opened a frog farm on a 8.1-ha tract of land 1/2 of a mile east of Lakeside on

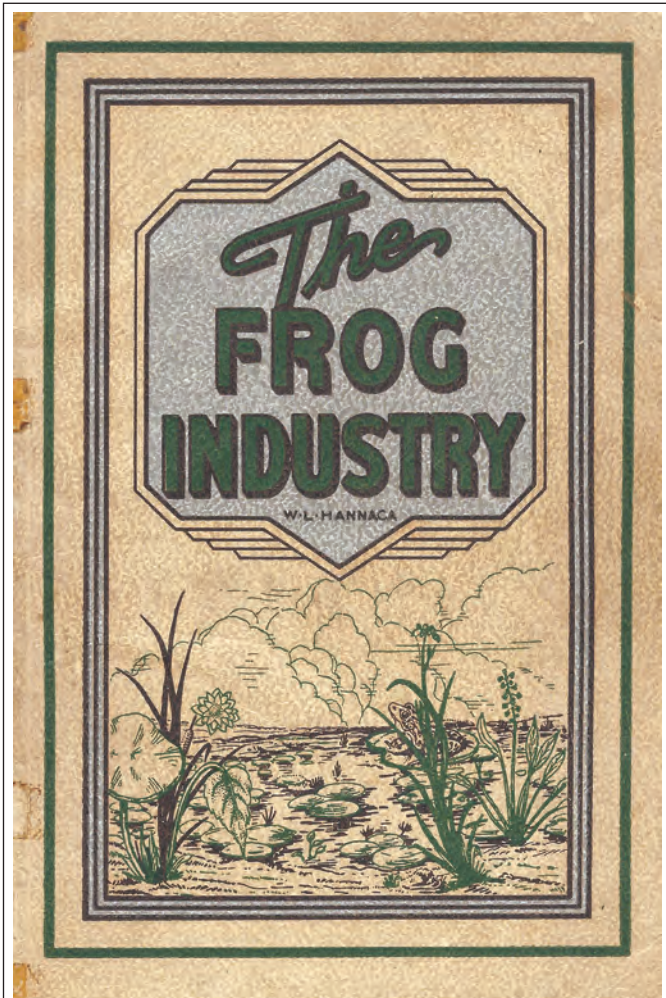


Fig. 19. Cover for *The Frog Industry* by W.L. Hannaca, Chariton Corporation, Chicago, 1933.

El Monte Road (near San Diego, San Diego County), California. Herriman, had previously been a student at Cornell University (class of 1919) and may have first learned about the economic value of frogs during his time there. Although his class work was interrupted by service in the Naval Aviation Section of the U.S. Navy during World War I, he subsequently received a degree in Civil Engineering. Soon after, he settled in San Diego, California where he opened wholesale lumber business with his father Morris Matthew Herriman (26 September 1861–9 June 1931). He subsequently became a home builder and general contractor, and finally a rancher.

The frog farm, officially known as “Lakeside Frog Farm Ltd.,” was originally set up with a board of directors and generated considerable media interest. Articles in the *San Diego Union* for 4 October 1931 and the *Los Angeles Times* and *Garden Magazine* for 31 January 1932 (Anonymous 1931b; Boone 1932) state that his operation was based on 2.7 ha with 3 constructed ponds fed by a well providing year-round water. He imported 53 pairs of Louisiana bullfrogs, 1,600 crayfish from Louisiana and Oregon, and 8,000 minnows from Louisiana to stock his ponds (Dunn 1932). The venture was

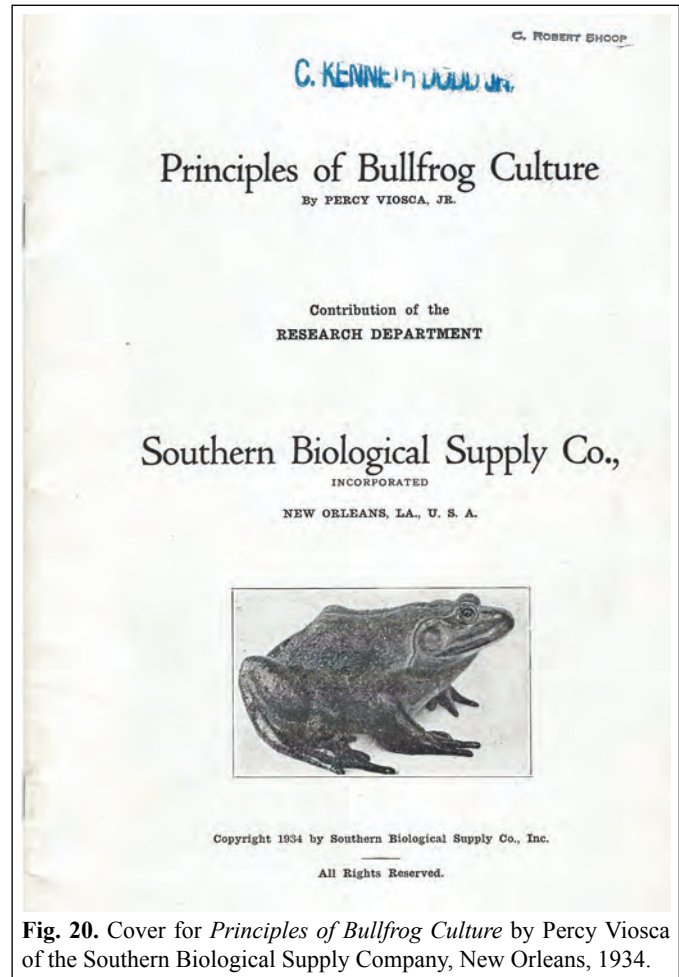


Fig. 20. Cover for *Principles of Bullfrog Culture* by Percy Viosca of the Southern Biological Supply Company, New Orleans, 1934.

called West Coast Frog Industries and its goal was to sell their products to the local markets—especially the Los Angeles area. Soon after starting the frog farm, he and his wife, along with his recently widowed mother, moved to a house in the San Fernando Valley, Los Angeles County, to be closer to potential markets. He subsequently offered adult and subadult bullfrogs, tadpoles, crayfish, minnows, and water plants for sale through a North Hollywood mailing address. In 1931³ (second edition 1933), he published a handbook on how to raise frogs based on his experiences that sold for \$2.00 a copy (Fig. 21). The original edition soon sold out, so a second, revised edition was published and sold. It's the second edition that's most often encountered.

Aside from the usual information on methodology, Herriman provided a diagram illustrating what he considered the best way to construct and position the ponds to provide multiple living food sources for his developing post-metamorphs. The book contains no other illustrations or photographs, although Dunn (1932) has black and white photos of one pond and Herriman dipping for frogs. Further information and photographs of the operation and personnel are provided in the newspaper articles mentioned above and in Herriman (1933b).

Herriman seems to have gotten out of the frog farming business during World War II. We could find no other refer-

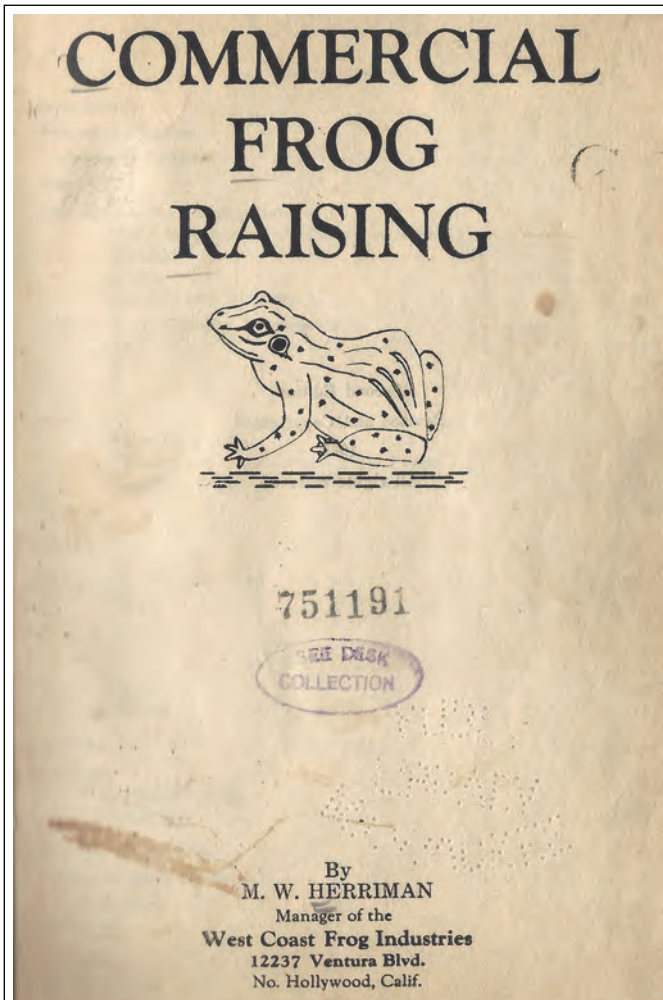


Fig. 21. Title page for *Commercial Frog Raising*, 2nd edition, by M.W. Herriman of the West Coast Frog Industries, North Hollywood, California, 1933.

ences to his operation other than that he is still listed as farmer in the 1940 Federal Census and a rancher in official voting records after that up to his death in 1946.

The next publication, *Ranaculture*, is a well-produced booklet published in 1933 by Irvin G. Schorsch (22 September 1901–2 February 1977) of the International Frog Farm, Philadelphia, Philadelphia County, Pennsylvania (Fig. 22). Schorsch was born in Philadelphia where his father managed a tailor shop, and started out as a real estate agent at the age of 18 before becoming a developer. According to reminiscences upon his death, Schorsch became interested in frog culture when he went bankrupt for the only time in his life during the Great Depression (Avery 1977). Although he owned 2 apartment houses at that time, the income generated wasn't enough to cover his expenses and so he was forced to pursue another occupation in 1932. The story goes that he had dinner where frog legs were served and he'd found out that only one firm in the Philadelphia area wholesaled frog legs. Thus, he employed local boys to catch frogs in the nearby swamps.

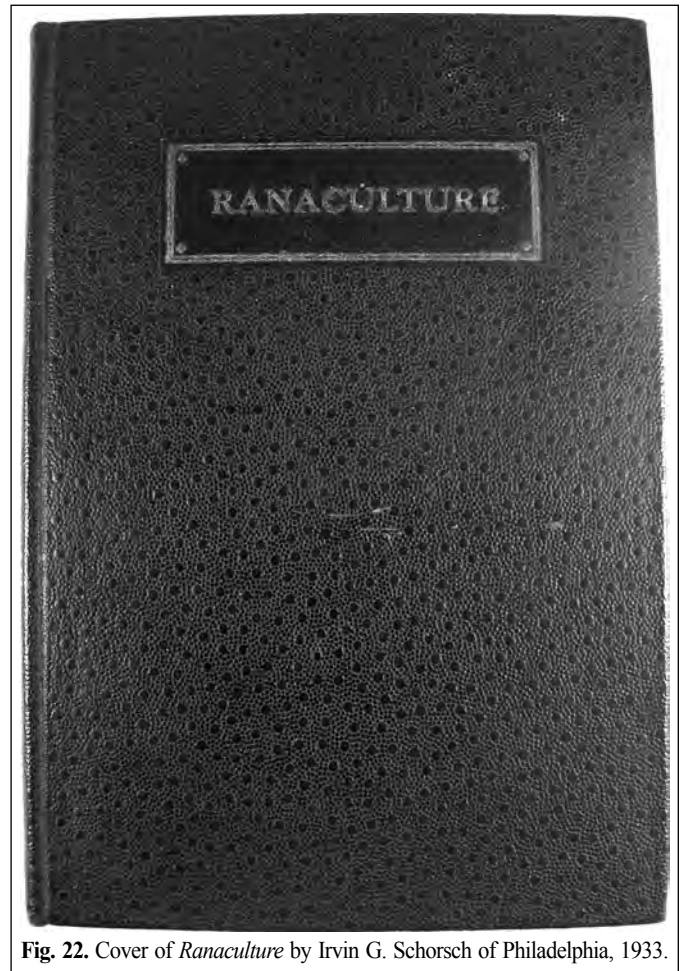


Fig. 22. Cover of *Ranaculture* by Irvin G. Schorsch of Philadelphia, 1933.

Ever the developer and entrepreneur, Schorsch decided to try frog farming, raise them to market size, and make a living—perhaps even a fortune. Thus, he opened the International Frog Farm, studied frog culture, and wrote up his findings. His booklet covers much more than the usual suggestions for methodology, such as mythology, the zoological classification of frogs, culture, adaptability and commercial aspects of "ranaculture." At the end of the book, there are 12 tables (p. 68–87) covering many aspects of anuran life history, such as anuran classification, eggs, tadpole information, growth rates, and size and weights. Three tables are devoted to the production of frog's legs in 1908, 1922, and 1931 based on U.S. Bureau of Fisheries leaflets. Most of the book is in text format providing a wealth of background information. Based on his experiences, Schorsch developed the "International House" methodology of frog propagation. This consisted literally of a house incorporating pens for breeding, yearlings, tadpoles, food and water plants, and packing; a diagram was provided (p. 57). Schorsch provided no information specifically pertaining to his operations or production.

After publication of his booklet, Schorsch continued to ply away at the business, which often required sending out boys to catch new frogs for the ones that died, or were eaten, or were needed for immediate sale. However, by 1934, he'd

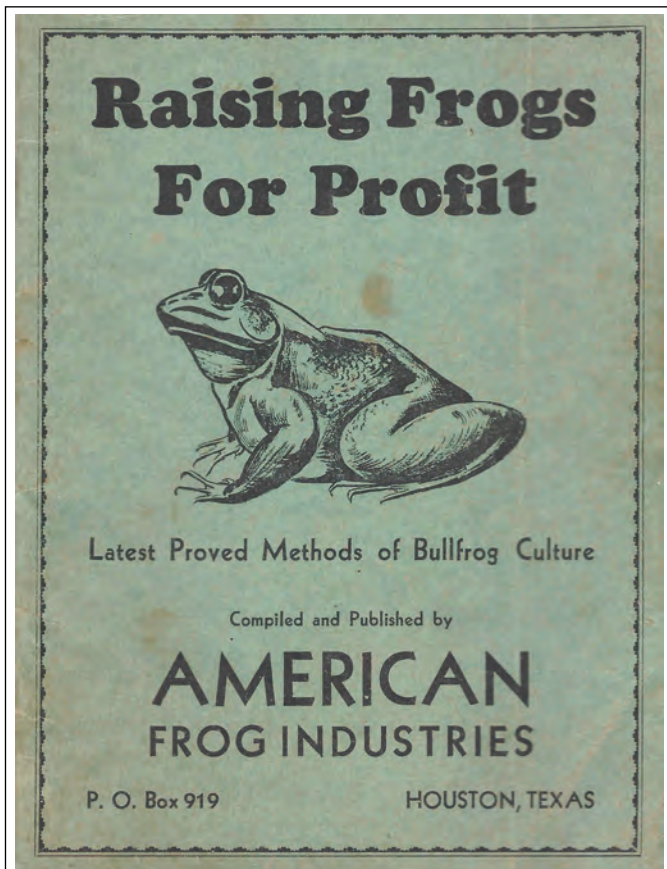


Fig. 23. Cover of *Raising Frogs for Profit*, American Frog Industries, Houston, Texas, 1933. No author is given.

had enough and he sold the farm—reportedly for no loss, but also for no profit as well. He also informed the public at this time that he would no longer be supplying frogs for restaurants or hotels. Instead, he would concentrate on selling frogs to chemists, zoologists, and pharmacologists for scientific purposes, as well as colleges and laboratories.

Schorsch subsequently went back into an entrepreneurial career with the real estate industry which cumulated in many important residential and commercial developments. He was forever known as the “Frog Man” and continued to receive orders for frogs until sometime in the 1960s. Presumably, he was still using young local boys to procure the needed frogs. Further information on him is in Avery (1977).

We only have one additional manual on frog farming from the 1930s, a small booklet published by the American Frog Industries (AFI), Houston, Texas (Anonymous 1933; Fig. 23). The booklet borrows information from previous publications, has a few illustrations of frogs and a suggested pond layout, several black and white photos of frog processing, and several recipes. This business marketed what it termed “the Latex Variety” of bullfrog, claimed to be much larger than other bullfrogs. American Frog Industries was a subsidiary of the Louisiana Frog Company of Rayne, Louisiana (Baer 1936). The Louisiana Frog Company supplied markets all over the country, whereas AFI was involved with frog cul-

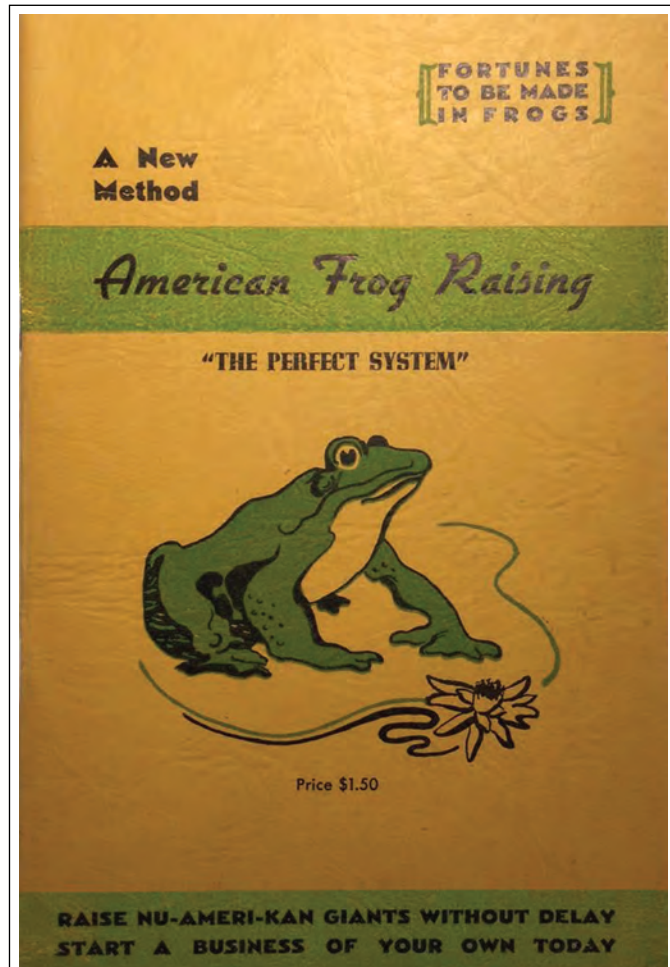


Fig. 24. Cover of *American Frog Raising* by Roy W. Mabie, 1936. Courtesy of Michael and Genny Winne, About Books, Henderson, Nevada.

ture. Photographs of the frog farming operation and associated festivals are in McCarty and Olinger (2002).

We have references to two other “how-to” manuals from the 1930s (Nunn 1932; Mabie 1936), but we have been unable to examine original copies. Robert Brewer Nunn (29 June 1905–24 October 1985) was a native of Brownsville, Tennessee. His family moved to Texas when he was young and he eventually worked as an advertising solicitor for a local Houston newspaper. He was associated with the Nunn Frog Farm of Houston, and certainly knew Ruffner as Ruffner (1933) cites his manual and lived in the same city. Nunn subsequently served in the Army Air Corps during World War II and later settled in southern California. He did no further research on frogs and died in Laguna Hills, California.

Roy Wallace Mabie (6 September 1892–29 June 1954) was a native of Nyack, New York. He subsequently moved to Lansing, Michigan, where he married and worked as a salesman for the Standard Oil Company. After service in the U.S. Army during World War I, he returned to Lansing and later divorced his wife and moved to New Jersey where he tried his hand at a number of professions (including working as a security

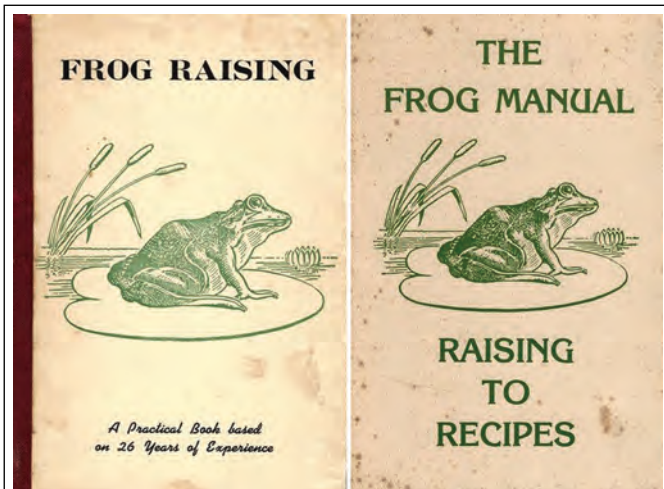


Fig. 25. Frog raising booklets published by the Brashears family of Berryville, Arkansas. Left, 1950. Right, 1982.

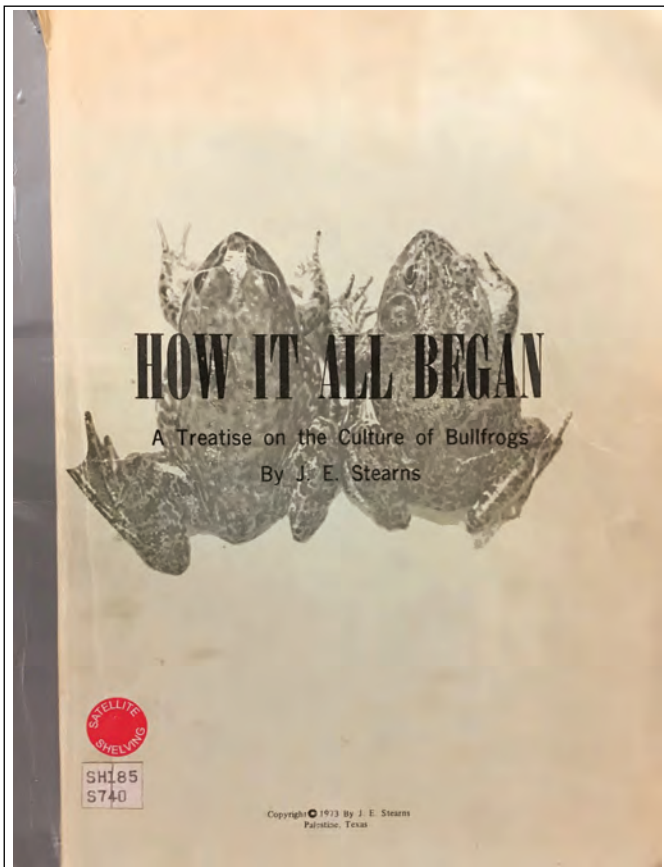


Fig. 26. Cover of Stearns (1973) from the copy at the Hunt Library at North Carolina State University, Raleigh.

guard) during the Great Depression. He apparently wrote up his 1936 manual while managing some property that he owned and privately published it via the American Frog Publishing Company of Ridgefield, New Jersey (Fig. 24). He subsequently became interested in stereoscopic devices (eventually establishing a business in New York City) and published a book on the subject (Mabie 1942). He died in Fort Lauderdale, Florida.

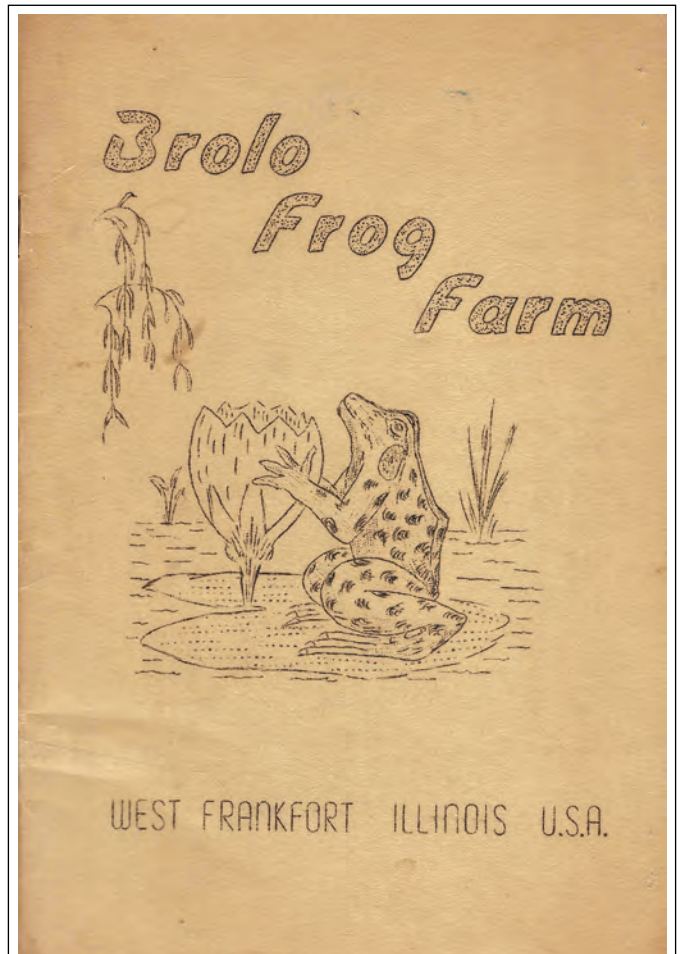


Fig. 27. Cover of the booklet published by the Brolo Frog Farm, West Frankfort, Illinois, 1953.

POST 1930s MANUALS

We have found five manuals on frog propagation following the 1930s. The most ambitious were those produced by the Brashears family of Berryville, Carroll County, Arkansas (Brashears and Brashears 1950, 1982: Fig. 25). These manuals involved three generations of the family, from grandfather Vol Brashears, Sr. (12 August 1897–8 June 1976) to his son, Vol Brashears Jr. (4 January 1923–15 May 2019), to Vol Brashears Jr.'s sons Vol Brashears III and Kent Baker Brashears. Vol Brashears, Sr., started out in 1935 building a lumber mill specializing in wagon parts and hay-bailers. To supplement his income during the Great Depression, he began collecting and marketing frogs. This turned into a frog raising business, which also involved the sale of breeders, tadpoles, minnows, and crayfish. The booklets were published by the Brashears on their home printing press. The 1950 edition is based on 23 years of experience in the frog business. It includes black and white photographs of the Brashears' operation in addition to text, including photos of Vol Brashears Sr. The 1982 edition is better produced and includes good line drawings and recipes, but no photographs.

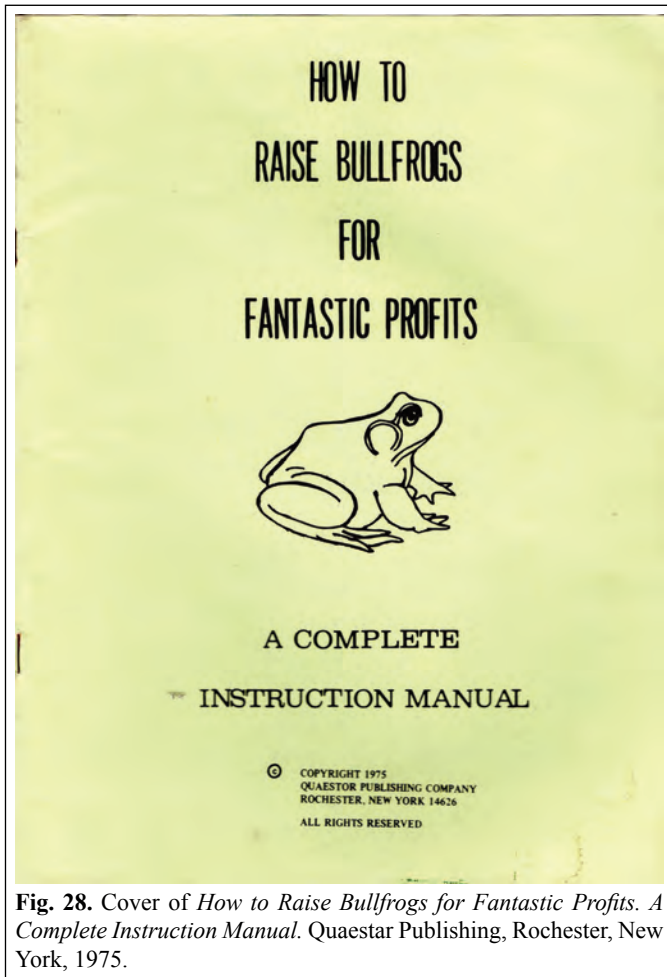


Fig. 28. Cover of *How to Raise Bullfrogs for Fantastic Profits*. *A Complete Instruction Manual*. Quaestar Publishing, Rochester, New York, 1975.

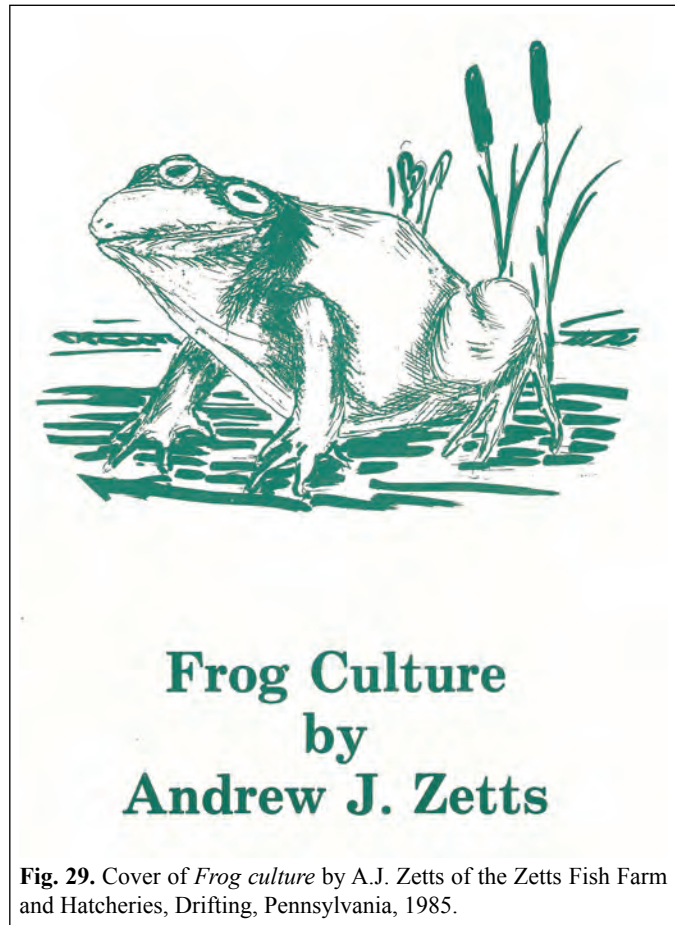


Fig. 29. Cover of *Frog culture* by A.J. Zetts of the Zetts Fish Farm and Hatcheries, Drifting, Pennsylvania, 1985.

In addition to frog raising, Vol Brashears Jr., took over the family business, Brashears Furniture Company in Berryville. His son Vol Brashears III founded Brashears & Associates in Houston, hence the place of publication of the 1982 edition. Information on Vol Brashears Jr. can be found in the *Lovely County Citizen* (2019).

There is also a typescript manuscript of some historical recollections of the frog farming activities of John (Gene) Elbert Stearns (22 July 1894–27 July 1975) that is available in three library collections (Jacksonville, Texas, Public Library, University of Missouri—Columbia Library, and Hunt Library at North Carolina State University, Raleigh) (Stearns 1973; Fig. 26). Stearns was originally from Greenfield, Massachusetts and moved to Palestine, Texas as a young boy where his father worked as an engineer for the local railroad. He eventually worked in the railroad industry as well as a switchman and brakeman until his job disappeared with the closing of the passenger rail line to Palestine in 1921. Since he was in debt, Stearns subsequently started catching and selling adult American Bullfrogs in the vicinity to local restaurants and dealers and because his catch was of such high quality and size, he eventually became acquainted with Percy Visoca. Not long after, Visoca brought him to New Orleans where he purportedly learned about culturing bullfrogs com-

mercially and also attended college for undergraduate and graduate degrees. By the late 1930s, he was helping people at a number of locations in Florida and California start commercial frog farms. This eventually led to the concrete tank system of culturing frogs (Anonymous 1939) that Stearns patented on 9 August 1938 (U.S. Patent No. 2,125,056). Stearns (1973) later claimed he received a Ph.D. and Master's degree from Tulane University in aquatic ecology, but there is no record of his attendance or of receiving any degree from Tulane (Ann E. Smith Case, University Archivist, Tulane University Special Collections Howard-Tilton Memorial Library, Tulane University, personal communication, 18 June 2021).

During World War II, Stearns was unable to find employment as a biologist or in frog farming, so he worked as a switchman and brakeman again (on and off) with the railroad industry along Texas and southern California lines. Eventually, he and his wife moved back to Palestine where Stearns worked in other fields before becoming involved in frog culture again after 1967 with Dudley Culley at Louisiana State University. This led to his assisting in the construction of the Southern Frog Farm in Dumas, Desha County, Arkansas.

Although Stearns (1973) does contain a small section entitled "Frog Culture," it is nothing more than a list of various observations and suggestions rather than detailed manual

on how to actually raise American Bullfrogs. The booklet included a Forward written by George Nace of the University of Michigan's Amphibian Facility and a letter from John Priddy of the Southern Frog Company confirming Stearn's expertise in building frog rearing facilities. This letter is undated. Stearns apparently died of heart failure in Alto, Texas, soon after completing his manuscript.

The remaining three manuals are much less ambitious. The Brolo Frog Farm, West Frankfort, Will County, Illinois, produced a small booklet focusing on their experiences in frog raising as well as information from previously published sources that are not credited (Brown 1953; Fig. 27). The booklet was typed, supplemented by crude drawings and illustrations to help a would-be farmer, and was written in a conversational format. It included a price list, for example, one pair of jumbo bullfrogs cost \$22.50 and 1000 tadpoles \$120. The farm also sold crayfish.

A bullfrog raising manual was published without an author attribution by Quaestar Publishing of Rochester, Monroe County, New York (Anonymous 1975; Fig. 28). The manual is typescript and stapled together, and there appears to be two versions of it, one much shorter than the other based on two copies of its table of contents in our possession. The usual subject matter appears in the table of contents, including a reference to a consultation service. We have not been able to find a complete copy of either version. Finally, The Zetts Fish Farm and Hatcheries, then of Drifting, Clearfield County, Pennsylvania, but now operating from Inwood, Berkeley County, West Virginia, produced a very short booklet (Zetts 1985; Fig. 29). The booklet only covers a basic outline of propagation and appears more promotional than instructive. It was published in green type, included green tinted photographs, and needed editing.

CONCLUSION

Despite the hype associated with commercial frog propagation, others involved in the developing industry attempted to guide their colleagues in the successful operation of a frog farm, usually at the cost of less than \$2/publication. Frog farms were frequently unsuccessful for a variety of reasons, and from the 1930s through today, many government agencies officially discourage entering the market because of the difficulties noted by even the earliest of its proponents. Still the hype continues—big profits for a small investment.

No doubt, there are other how-to manuals that we have overlooked, and we would be interested in obtaining those and some of the others mentioned above (Herriman 1931; Nunn 1932; Mabie 1936; Anonymous 1975). For example, Florida Department of Agriculture (1936) noted a frog manual being published by Lamar Gordon Warren (27 September 1910–12 April 1997) of Palatka, Florida, but we have been unable to find any information about such a publication. The address listed in Florida Department of Agriculture (1936) is for a law office where he worked as a court reporter in the

nearby court house. Warren subsequently became an attorney in Tallahassee, Florida. He died in Ft. Lauderdale, Florida.

ACKNOWLEDGEMENTS

We thank Walter Meshaka for assistance in providing the cover of Meehan (1906) and Bob Nawrocki of the St. Augustine Historical Society for information on Lamar Warren in the early 1930s in St. Augustine. Elena Smith (California State Library, Sacramento) provided the scan of the cover of Santen, 1912; Marcia Caudell (The Evergreen Indiana Open-Source ILS Initiative) confirmed the 1960 date on Broel's *Frog Raising for Pleasure and Profit* in their collection; Michael and Genny Winne (About Books, Henderson, Nevada) provided the scan of the cover of Mabie, 1936. Dudley D. Culley, Jr., kindly provided some of the references of his published papers. Ann E. Smith Case (Tulane University) searched for records of John E. Stearns' attendance at that university. Additional help was provided by Breck Bartholomew and Christopher Bell. Special thanks go to the late Dr. Ruth Risdon Storer, who gave permission to MRJ to copy and utilize information from her deceased husband's field journals and files.

NOTES

1. The Storer letters, field notes, and other documents cited are in the Tracy Storer Collection in the Archives of the California Academy of Sciences.
2. Wright's (1920) paper was available from the U.S. Government Printing Office at a cost of 15 cents; it was out of print by 1932.
3. We have been unable to locate more than a single copy of these publications. Brown is in CKD's personal collection; Mabie is owned by About Books, Henderson, Nevada. Neither is listed in the World Catalogue.

REFERENCES

- Adler, K. 2012. Viosca, Percy, Jr. (1892–1961). Pp. 222–223 in: *Contributions to the History of Herpetology. Volume 3*. Society for the Study of Amphibians and Reptiles, Contributions to Herpetology, Vol. 29. Vancouver, British Columbia.
- Alcock, T. 1884. On the development of the common frog. *Memoirs of the Manchester Literary and Philosophical Society* 8:89–125.
- Anonymous. 1899. Miss Seldon's frog farm. *The Evening Star*, Washington, DC., 4 February 1899.
- Anonymous. 1925. Tadpoles start of hatchery for table delicacy. *Oakland Tribune*, 102(99):19, 9 April 1925.
- Anonymous. 1931a. Frog industry in Louisiana. *Louisiana Department of Conservation, Division of Fisheries Educational Pamphlet* No. 2. 40 p.
- Anonymous. 1931b. New frog farm at Lakeside seen as big industry. *San Diego Union*, 4 October 1931.
- Anonymous. 1933. *Raising Frogs for Profit*. American Frog Industries, Houston, Texas. 40 p.
- Anonymous. 1935a. The "not raising" frog business. *Turtlox News* 13(1):16

- Anonymous. 1935b. Frog industry in Louisiana. *Louisiana Department of Conservation, Division of Fisheries Bulletin* No. 26. 44 p. [reprinted 1938 and 1939, 47 p.]
- Anonymous. 1939. Tanks simplify bullfrog culture. *Mechanix Illustrated* (June):51, 102. [The author of this paper is unknown, but Stearns (1973) says it was a writer from Boston, Massachusetts.]
- Anonymous. 1975. *How to Raise Bullfrogs for Fantastic Profits. A Complete Instruction Manual*. Quaestar Publishing, Rochester, New York. 61 p.
- Avery, R. 1977. He made big money on everything but frogs. Bucks County (Pennsylvania) Courier Times, 13 February 1977, p. D-5.
- Baer, L.H. 1936. Letter. Description of the Louisiana Frog Company in Rayne, Louisiana, from 1936. State Library of Louisiana, Louisiana Works Progress Administration. Accessed 17 February 2021.
- Baker, R.H. 1942. The bullfrog. A Texas wildlife resource. *Texas Game, Fish and Oyster Commission, Bulletin* No. 23, 7 p.
- Barnum, B.B. 1953. Like to be a frog farmer? *The Reclamation ERA* 39(6):118–119.
- Bierbrier, F.E. 1905. *The Ranidae. How to Breed, Feed and Raise the Edible Frog*. Meadow Brook Farm, Allendale, New Jersey. 30 p.
- Boone, A.R. 1932. “Brekekeke Koax.” The noisiest “farm” goes on the air. Los Angeles Times Farm and Garden Magazine, 31 January 1932.
- Brashears, V. Sr., and V. Brashears, Jr. 1950. *Frog Raising*. Brashears Printing Co., Berryville, Arkansas. 102 p.
- Brashears, V. III, and K.B. Brashears. 1982. *The Frog Manual. Raising to Recipes*. Brashears, Houston. 71 p.
- Broel, A. 1934. History of the Frog Industry. The Broel System of Giant Bullfrog Culture. Lesson No. 1, American Frog Canning Company, New Orleans, Louisiana. 7 p.
- Broel, A. 1935a. Possibilities of Frog Farming. The Broel System of Giant Bullfrog Culture. Lesson No. 2, American Frog Canning Company, New Orleans, Louisiana. 9 p.
- Broel, A. 1935b. Getting Acquainted with Frogs. The Broel System of Giant Bullfrog Culture. Lesson No. 3, American Frog Canning Company, New Orleans, Louisiana. 17 p.
- Broel, A. 1935c. Where to Make your Pond. The Broel System of Giant Bullfrog Culture. Lesson No. 4, American Frog Canning Company, New Orleans, Louisiana. 13 p.
- Broel, A. 1935d. Digging your Pond with the Broel System. The Broel System of Giant Bullfrog Culture. Lesson No. 5, American Frog Canning Company, New Orleans, Louisiana. 18 p.
- Broel, A. 1935e. Making your Pond hold Water. The Broel System of Giant Bullfrog Culture. Lesson No. 6, American Frog Canning Company, New Orleans, Louisiana. 15 p.
- Broel, A. 1935f. What the Pond Should Contain. The Broel System of Giant Bullfrog Culture. Lesson No. 7, American Frog Canning Company, New Orleans, Louisiana. 18 p.
- Broel, A. 1936a. Caring for Tadpoles. The Broel System of Giant Bullfrog Culture. Lesson No. 8, American Frog Canning Company, New Orleans, Louisiana. 14 p.
- Broel, A. 1936b. Raising Food for Frogs. The Broel System of Giant Bullfrog Culture. Lesson No. 9, American Frog Canning Company, New Orleans, Louisiana. 17 p.
- Broel, A. 1936c. The Breeding Season. The Broel System of Giant Bullfrog Culture. Lesson No. 10, American Frog Canning Company, New Orleans, Louisiana. 16 p.
- Broel, A. 1936d. Caring for Baby Bullfrogs. The Broel System of Giant Bullfrog Culture. Lesson No. 11, American Frog Canning Company, New Orleans, Louisiana. 13 p.
- Broel, A. 1936e. Raising Food in Large Quantities. The Broel System of Giant Bullfrog Culture. Lesson No. 12, American Frog Canning Company, New Orleans, Louisiana. 12 p.
- Broel, A. 1936f. More Feeding Systems. The Broel System of Giant Bullfrog Culture. Lesson No. 13, American Frog Canning Company, New Orleans, Louisiana. 17 p.
- Broel, A. 1936g. Feeding Frogs for the Market. The Broel System of Giant Bullfrog Culture. Lesson No. 14, American Frog Canning Company, New Orleans, Louisiana. 12 p.
- Broel, A. 1936h. A large Commercial Bullfrog Ranch. The Broel System of Giant Bullfrog Culture. Lesson No. 15, American Frog Canning Company, New Orleans, Louisiana. 11 p.
- Broel, A. 1936i. The Frog Market. were issued in 1936. The Broel System of Giant Bullfrog Culture. Lesson No. 16, American Frog Canning Company, New Orleans, Louisiana. 11 p.
- Broel, A. 1936j. Vegetation. The Broel System of Giant Bullfrog Culture. Special Supplement No. 1, American Frog Canning Company, New Orleans, Louisiana. 11 p.
- Broel, A. 1936k. Before Breeders Arrive. The Broel System of Giant Bullfrog Culture. Special Supplement No. 2, American Frog Canning Company, New Orleans, Louisiana. 10 p.
- Broel, A. 1937a. *Frog Raising*. American Frog Canning Co., New Orleans. 48 p. [Facsimile edition published by D. Van Alstine, 1983, Dell Publishing Co., New York]
- Broel, A. 1937b. Worm Culture. The Broel System of Giant Bullfrog Culture. Special Supplement No. 3, American Frog Canning Company, New Orleans, Louisiana. 13 p.
- Broel, A. 1937c. *Frog Farm Catalogue*. American Frog Canning Co., New Orleans, Louisiana.
- Broel, A. 1943. *Frog Raising*. Marlboro House, Detroit. 164 p. Spiral Bound. [Other copies dated 1944, 1945. The 1943 edition has a yellow cover, and the 1945 a blue cover. The images are the same, however. We have not seen the 1944 edition.]
- Broel, A. 1950. *Frog Raising for Pleasure and Profit*. Marlboro House, New Orleans. 175 pp. [The place of publication of the 1950 and 1951 editions is listed as New Orleans; the later issues are listed as Detroit. Other copies dated 1951, 1953, 1954, 1960; we have been able to locate only a single copy dated 1960. It is in the Indiana State Library, Indianapolis (ISLM 639.3 B865F)].
- Broel, B. 2007. *House of Broel. The Inside Story*. House of Broel Foundation, New Orleans. xii, 410 p.
- Brown, W. 1953. Brolo Frog Farm. Privately published, West Frankfort, Illinois. 45 p. [We have been able to locate only a single copy of this publication. It is in CKD’s personal collection.]
- Bryan, E.H., Jr. 1932. Frogs in Hawaii. *Mid-Pacific Magazine* 43(1):61–64.
- Buller, C.R. 1928. Methods employed in producing the bullfrog (*Rana catesbeiana*) tadpoles at the Pennsylvania State hatcheries. *Pennsylvania State Board of Fish Commissioners Bulletin* No. 6, 13 p. [reprinted 1933]
- Chamberlain, F.M. 1897. Notes on the edible frogs of the United States and their artificial propagation. *U.S. Bureau of Fisheries for 1897*:249–261.
- Coombes, S. C. 1902. *Frog-raising; As Good and Better Than Many Gold Mines; The Only Book in the Whole Wide World on the Cultivation, Development, and Various Uses of the Common Edible Frog; How to Breed and Feed It, and How to Protect It From Its Enemies, Etc.* South San Francisco, San Mateo County, California. 24 p.
- Culley, D.D., and C. Gravois. 1970. A new look at an old problem. *The American Fish Farmer* 1(5):5–10.

- Culley, D.D., and C. Gravois. 1971. Recent developments in frog culture. *Proceedings of the 25th Annual Conference of the Southeastern Association of Game and Fish Commissioners*, p. 583–597.
- Culley Jr., D.D., N.D. Horsemann, R.L. Amborski, and S.P. Meyers. 1978. Current status of amphibian culture with emphasis on nutrition, diseases, and reproduction of the bullfrog, *Rana catesbeiana*. *Proceedings of the Annual Meeting of the World Mariculture Society* 9(1–4):653–669.
- Dickerson, M.C. 1906. *The Frog Book*. Doubleday, Page, and Company, New York. 253 p.
- Documents of the Senate of the State of New York. 1902. *One Hundred and Twenty-fifth Session*. Volume XXII, Numbers 39–42, Inclusive. J.B. Lyon Company, Albany. [see p. 169]
- Dunn, H.H. 1932. Frogs by the million raised on odd farm. *Popular Science Monthly* 120(2):54–55, 134.
- Dyche, L.L. 1914. Ponds, pond fish, and pond fish culture. *Kansas Department of Fish and Game, Bulletin* 1.
- FTC (Federal Trade Commission). 1939. *Federal Trade Commission Decisions. Findings, Orders, and Stipulations*. January 14, 1936, to July 9, 1936. Volume 22. United States Government Printing Office, Washington. [see p. 1033–1035]
- Fenton, M.H. undated [1928]. *Scientific Method of Bullfrog Culture in Connection with Muskrat Farming*. M.H. Fenton Publisher, Pickering, Ontario. 53 p.
- Fenton, M.H. 1932. *Scientific Method of Raising Jumbo Bullfrogs*. 2nd ed. rev., Chariton Fur and Frog Farm Inc., Chicago. 80 p.
- Florida Department of Agriculture. 1936. Bullfrog farming and frogging in Florida. *Bulletin (new series)* No. 56. 81 p. [reprinted 1952, 82 p.]
- Hannaca, W.L. 1933. *The Frog Industry*. Chariton Corporation, Chicago. 94 p.
- Heard, M. 1904. A California frog ranch. *Out West* 21:20–27.
- Heilman, B. 1963. The frogs of spring are springing for their lives. *Sports Illustrated* 18:46–48; 62–64.
- Helfrich, L.A., R.J. Neves, and J. Parkhurst. 2009. Commercial frog farming. *Virginia Cooperative Extension, Publication* 420–255, 4 p.
- Herriman, M.W. 1933a. *Commercial Frog Raising*. 2nd edition. West Coast Frog Industries, North Hollywood, California. 52 p. [A first edition apparently was published in 1931, but we have been unable to locate a copy to confirm whether the content and page numbers are the same as in the second edition.]
- Herriman, M.W. 1933b. Farming a million bullfrogs. *Wide World Magazine* [?]:60–68. [We have been unable to determine which issue of this monthly publication contains the Herriman paper.]
- Hince, B. 2011. ‘Paradise,’ Euroa. Australia’s first frog farm. *Australasian-Pacific Journal of Regional Food Studies* 1:130–155.
- Howard, R.D. 1988. Reproductive success in two species of anurans. Pp. 99–113 in: T.H. Clutton-Brock (ed.), *Reproductive Success. Studies of Individual Variation in Controlling Breeding Systems*. University of Chicago Press, Chicago.
- Jennings, M.R. 1987. Faces from the past: Frederic Morton Chamberlain (1867–1921), pioneer fishery biologist of the American West. *Fisheries* 12(6):22–29.
- Jennings, M.R. 2004. An annotated check list of the amphibians and reptiles of California and adjacent waters. *California Fish and Game* 90:161–213.
- Jennings, M.R., and M.P. Hayes. 1984. The frogs of Tulare. *Outdoor California* 45(6):17–19.
- Jennings, M.R., and M.P. Hayes. 1985. Pre-1900 overharvest of California red-legged frogs (*Rana aurora draytonii*): the inducement for bullfrog (*Rana catesbeiana*) introduction. *Herpetologica* 41:94–103.
- Laskow, S. 2017. The giant frog farms of the 1930s were a giant failure. *Atlas Obscura*, 27 October 2017. Accessed 28 January 2021.
- Lovely County Citizen. 2019. A life well lived: Brashears remembered for positive spirit, love of family. *Lovely County Citizen*, Eureka Springs, Arkansas, 29 May 2019.
- Lucas, W. 1965. Bullfrog legs becoming big thing for farmers in Pender County Com. *Rocky Mount (North Carolina) Telegram*, 14 June 1965, p. 9.
- Mabie, R.W. 1936. *American Frog Raising*. American Frog Publishing Company, Ridgefield, New Jersey. 28 p. [We have been able to locate only a single copy of this publication. It is owned by About Books, Henderson, Nevada. It is not listed in the World Catalogue.]
- Mabie, R. W. 1942. *The Stereoscope and Stereograph: A Handbook, Price List and Catalogue Featuring the Americana in the Stereoscope and Stereograph, and Listing Early European Views*. Mabie’s Stereoscopic Galleries, New York. 72 p.
- McCarty, C., and T. Olinger. 2002. *Images of America. Rayne*. Arcadia Publishing, Charleston, South Carolina. 128 p.
- Meehan, W.E. 1906. *Frog-farming*. Pennsylvania Department of Fisheries, Bulletin No. 4. 13 p.
- Meehan, W.E. 1908a. Frog farming an industry. *Technical World Magazine* 9(3):246–250.
- Meehan, W.E. 1908b. Possibilities of frog farming. *Country Life in America* 13:614–615, 640.
- Meehan, W.E., and E.A. Andrews. 1908. Frogs, *Rana* spp., Ranidae. Pp. 394–395 in: L.H. Bailey (ed.), *Cyclopedia of American Agriculture. A Popular Survey of Agricultural Conditions, Practices and Ideals in the United States and Canada*. Macmillan, New York.
- Meehan, W.E. 1913. *Fish Culture in Ponds and Other Inland Waters*. Sturgis and Walton Company, New York. 287 p.
- Missouri Department of Conservation. undated. Frog farming, fact or fiction? *Aquaguide, Pond Management Series*, 3 p.
- Montgomery, F.A., Jr. 1936. Frog farming. *Scientific American* 155:280–281.
- Nunn, R.B. 1932. *Scientific Frog Farming*. Nunn Frog Company, Houston. 16 p. [not seen]
- Patera, P. 1978. There’s big money in the secret art of frog farming. *Mother Earth News*, July/August. Accessed 18 February 2021.
- Penn, G.H. 1962. Bibliography of Percy Viosca, Jr. (with a few annotations). *Tulane Studies in Zoology* 9:239–242.
- Priddy, J.M., and D.D. Culley, Jr. 1971. The frog culture industry, past and present. *Proceedings of the Annual Conference of the Southeastern Association of Game and Fish Commissioners* 25:597–601.
- Randel, W.A. 1914. *Frog Culture for Profit*. Aqua Life Co., Seymour, Connecticut. 61 p.
- Ruffner, B.M. 1933. *Practical Frog Raising*. Southern Frog Farms, Jennings, Louisiana. 80 p.
- Santen, H.G. 1912. *French Frog Farming*. Weybret-Lee Company, Monterey, California. 26 p.
- Schmidt, K.P. 1935. How to make money from frog-farming. *Turtlex News* 13:75–76.
- Schmidt, K.P. 1946. How to make money from frog-farming. *Turtlex News* 24:169–170.
- Schorsch, I.G. 1933. *Ranaculture*. George H. Buchanan Co., Philadelphia. 87 p.

- Schutt, S.L. 1934. Big profits in back yard frog raising. *Modern Mechanix and Invention* 12(May):87, 128.
- Sibley, C.L. 1912. The frog in Canadian diet. *Maclean's Magazine*, Montreal. 1 September 1912.
- Stearns, J. E. 1973. *How It All Began. A Treatise on the Culture of Bullfrogs*. Privately Published, Palestine, Texas. 60 p.
- Storer, T.I. 1933. Frogs and their commercial use. *California Fish and Game* 19:203–213. [reprinted in *Outdoor Nebraska*, October 1933 8(4):5; 11; 15.]
- Stoutamire, R. 1932. Bullfrog farming and frogging in Florida. *State of Florida, Department of Agriculture Bulletin (new series)* No. 56. 12 p.
- Troyer, D. 2019. Western Innovator: Frog ‘ranch’ keeps owners hopping. Capital Press, Salem, Oregon, 12 July 2019. Accessed 29 January 2021.
- United States Congress. 1901. *Report of the Commissioner-General of the United States to the International Universal Exposition, Paris, 1900*. Volume IV. United States Government Printing Office, Washington. [see p. 200].
- USDC (U.S. Department of Commerce). 1922. Frog culture. *Bureau of Fisheries, Information Leaflet I-2*, Washington, D.C. [identical copies dated May 1922, January 1923, July 1924]
- USDC. 1932a. Frog culture. *Bureau of Fisheries Information Leaflet I-2*. Washington, D.C. 6 p. [different content and format from previous versions]
- USDC. 1932b. Commercial frog industry of the United States. *Bureau of Fisheries, Supplement to Information Leaflet I-2*, Washington, D.C. 3 p.
- USDC. 1933. Frog culture and the frog industry. Bureau of Fisheries Information Leaflet I-2, Washington, D.C. 8 pp. [another copy dated October 1936]
- USDI (U.S. Department of Interior). 1944. Frog culture and the frog industry. *Fishery Leaflet* 102. 4 p.
- USDI. 1956. Commercial possibilities and limitations in frog raising. *Fishery Leaflet* 436. 4 p. [later issue dated 1965]
- Viosca, P., Jr. 1931. Principles of bullfrog (*Rana catesbeiana*) culture. *Transactions of the American Fisheries Society* 61:262–269.
- Viosca, P., Jr. 1934. *Principles of Bullfrog Culture*. Southern Biological Supply Company, New Orleans. 31 p.
- Wister, O. 1902. *The Virginian: A Horseman of the Plains*. Macmillan and Company, New York. 504 p.
- Wright, A.H. 1920. Frogs: Their Natural History and Utilization. Appendix VI to the *Report of the U.S. Commissioner of Fisheries for 1919*. [Bureau of Fisheries Doc. no. 888.] U.S. Government Printing Office, Washington.
- Zetts, A.J. 1985. *Frog culture*. Zetts Fish Farm and Hatcheries, Drifting, Pennsylvania. 13 p.

We suggest the following format for citing this article:

Dodd, C. K. Jr. and M. R. Jennings 2021. How to Raise a Bullfrog—The Literature on Frog Farming in North America. *Bibliotheca Herpetologica* 15(8):77–100.



The frogs of Christoph Froschauer (ca. 1490–1564), the first printer of Zurich

Dr. h. c. René E. Honegger

Mythenstrasse 6, CH 8802 Kilchberg, Switzerland, reh8802@gmx.ch

INTRODUCTION

In 1519, the German book-printer, Christoph Froschauer (ca. 1490–1564) immigrated from Kastle, near Altötting, Bavaria to Zurich, Switzerland. There, he was naturalized on November 9, 1519, in «recognition of his art» (Fig. 1).

In Zurich he established what was to become one of the leading publishers in the German speaking part of Europe. In 1521, the first book printed by him appeared. The author of the opus was Erasmus from Rotterdam (1466–1536), the translation into German was done by Leo Jud (1482–1542), priest at Einsiedeln Monastery in Switzerland.

Froschauer was very close to the Swiss Reformer Ulrich Zwingli (1484–1531), and Zwingli's first manuscripts were printed by Froschauer. Between 1524 and 1529, he printed the first edition of the Zwingli edition of the Bible in German, thus several years before Luther's Bible. With about 760 publications Froschauer is one of the big names within the German speaking world of publishing (Leu 2019).

PRINTER'S MARKS BY FROSCHAUER

Froschauer used to mark many of his publications with a number of personal printer's marks. He chose them according to the size of the book, but all of them refer to his family name «Froschauer», meaning: «the man from the floodplain full of frogs». Those printer's marks are of herpetological interest (Fig. 2).

They show a willow tree, with three frogs sitting around and a fourth one climbing the tree, or the same tree, around which winds a banner with the words «CHRISTOF FROSCHOVER ZVO ZVRICH», and the whole mark with or without border. A later mark shows in front of the tree a naked boy or Genius, riding a large frog. All these figures are placed in a floodplain.

The oldest bookmark depicts, in an architectural frame, the naked Genius riding a frog, wearing a helmet. In his left hand holding the bridle, in the right one a flag with the letters: CR. FR., on the base the year's date 1521 (Leeman-van Elk 1940, Heitz 1895). This woodcut clearly depicts a «Wasserfrosch»—a species of European Green Frogs (*Pelophylax spec.*)—and is a very early, clear and modern illustration of that taxa (Honegger & Grossenbacher 2019) (Fig. 3).

Froschauer was also the printer of the many publications by Conrad Gessner (1516–1565). Among them, the first



Fig. 1. Christoffel Froschauer, 1556. (Orell Füssli Graphische Betriebe AG, Zürich).

encyclopedia of animals «*Historiae animalium liber I. de quadrupedibus viviparis*» (1551) (Leu 2016).

THE FROGS AROUND FROSCHAUER

Rather famous is also the city view of Zurich, a wood cut by Josef Murer (1530–1580) in 1576, printed and distributed by Froschauer. In the upper-right corner, Froschauer's coat of arms also shows a frog (Fig. 4).

This plan documents not only the walls and town moats around the city (about 8,500 inhabitants), but clearly illustrates the city's geographical position between the Lake of Zurich, the river Limmat and the Schanzengraben and Froeschengraben Moat, literally the moat where the frogs live. The river and the mentioned moats drain the lake. At those



Fig. 2. The printer's mark by Froschauer refer to his family-name: «The man from the floodplain full of frogs», 1525. Zentralbibliothek Zurich [ZB].

times, the medieval city was surrounded by polymorphic wetland areas, habitats of Brown (*Rana temporaria*) and Green Frogs (*Pelophylax spp.*).

The frog-rains «Froschregen», are the remarkable events, when specific circumstances—synchronous with the final stage of metamorphosis, rainfall, and adequate temperature—metapopulations of froglets leave their breeding ponds within a short time on the same night to disperse.

In those times, the phenomenon of frog-rains must have been a well known fact: In 1697, J. D. Preissler illustrated it with a copper engraving: «The entire countryside is plagued by frogs». [«Das ganze Land wird von der Froschplage heimgesucht»]. It shows a town wall with many metamorphosing frogs; around the picture various stages of development from egg to tadpole are sketched (Fig. 5).

Those species also played an important part in the daily life of both the inhabitants of the city and of the people in the countryside. These animals formed part of people's regular nourishment not only during periods of famine. In the catholic regions, frogs legs were a favored food during Lent, as they originated like fish from water. The frogs coming out after hibernation were collected in the wetlands and sold in



Fig. 3. The earliest bookmark of Froschauer, 1521, a clear and modern wood-cut depicts a «Wasserfrosch», a species of European Green Frogs (*Pelophylax sp.*). ZB, e-rara-40113.

markets (Stephan & Prilloff 2017) or advertised by marked criers for the processing of frog legs. Number 116 of David Herrlibergers (1697–1751) cheerful Ausruff images (Ausruf-Bildchen) show such a scene of 1751 in Zurich (Herrliberger & Ulrich 1968) (Figs. 6 and 7).

At the Rheinau Monastery, near Zurich, 35,250 pairs of *Rana temporaria* legs were consumed between 1837 and 1841 (Meyer von Knonau 1844).

Because of early and continuous meliorations and the Swiss World War Two «Battle of Cultivation» [Anbauschlacht], the wet-land areas around Zurich have been reduced to ridiculously small patches today (Schmidt 2018). The Froeschengraben-moat, that part of the historic fortification, was filled up in the late 1860s. The world famous shopping and banking area of Bahnhofstrasse can be found at this place today.

After Reformation, in 1531, Froschauer acquired the former nunnery St. Verena, and turned it into his home. He had a nearby fountain crowned with his emblems: A giant frog with a boy riding on it, holding his banner. The sculptor is not known. The statue stands on a column at the base in an octagonal fountain basin. Today, this historic fountain is an interesting site in the old town, near the Central Library.

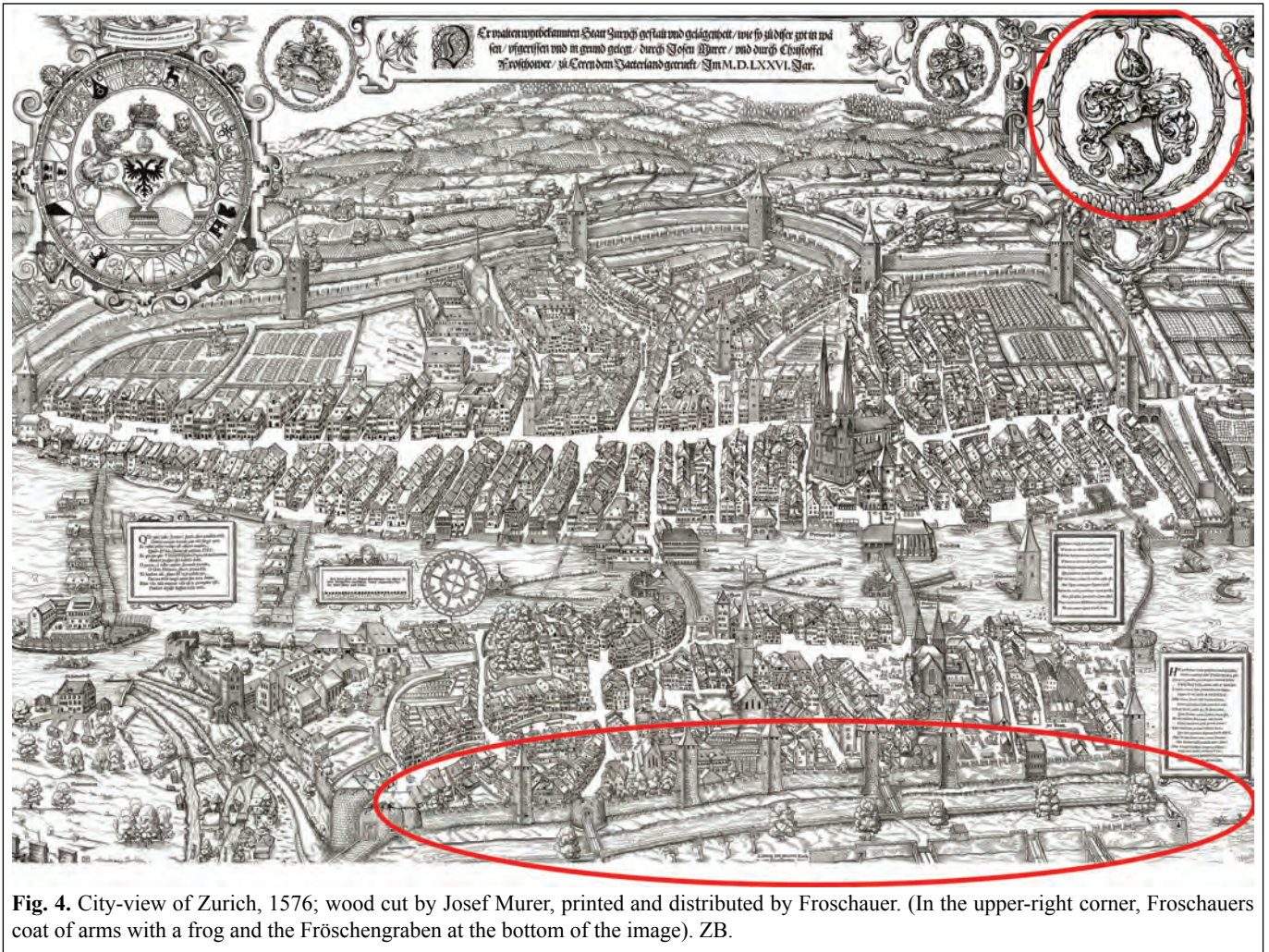


Fig. 4. City-view of Zurich, 1576; wood cut by Josef Murer, printed and distributed by Froschauer. (In the upper-right corner, Froschauer's coat of arms with a frog and the Fröschengraben at the bottom of the image). ZB.

Nearby also runs the Froschauer-Gasse, a small lane named after the printer (Figs. 8 and Fig. 9).

THE FROG OF CHRISTOPH FROSCHAUER

Recently a team lead by Angelica Crottini of the University of Porto, Portugal, did field-work on the anuran-fauna on the Sahamalaza peninsula in the Sofia region of NW-Madagascar. As Zurich Zoo is also engaged in a long-time conservation project in the north of Madagascar, on Masoala Peninsula, part of that work was supported by Zurich Zoo. It was financed by Orell Füssli Zürich ©, the successor of Froschauer's officins at the occasion of the 500th anniversary of his citizenship in November 2019.

In May 2020 Crottini et al. described *Stumpffia froschaueri* sp. nov. The specific name is an homage to Christoph Froschauer. The new species is known only from a highly degraded habitat. It is threatened by habitat loss and fragmentation. Thus, the authors suggest that the new species is qualified as Critically Endangered of the IUCN Red List (Crottini et al. 2020) (Fig. 10).

ACKNOWLEDGEMENTS

I thank Sabine Baer-Graf and George Bach for linguistic, and Drs. Franz Carl and Jan Roehmer for IT assistance. I also thank Dr. Urs Leu of Zentralbibliothek Zurich, S. Pepe of Baugeschichtliches Archiv Zürich, and Breck Bartholomew and Ralph Tramontano for historical and editorial support.

REFERENCES

- Crottini, A., G. M. Rosa, S. G. Penny, W. Cocca, M. W. Holderied, L. M.S. Rakotozafy & F. Andreone. 2020. A new stump-toed frog from the transitional forests of NW Madagascar (Anura, Microhylidae, Cophylinae, *Stumpffia*). *ZooKeys* 933:139–164.
- Gessner, C. 1551. *Historiae animalium liber I. de quadrupedibus viviparis*. Froschauer, Zürich.
- Heitz, P. 1895. *Die Zürcher Büchermarken bis zum Anfang des 17. Jahrhunderts*. Fäsi & Beer, Zürich, 47 p.
- Herrliberger, D. and C. Ulrich. 1968. *Zürcherische Ausrufbilder*. Berichthaus, Zürich, 27 p.



Fig. 5. Frog-rain: Around the picture various stages of development from egg to tadpole are sketched (Metamorphosis). Copper engraving, J. D. Preissler 1697, in Scheuchzer & Pfeffel (1731–1735). (ETH-Bibliothek Rar 5864).



Fig. 6. Marketstand, selling frog-legs (left), Constance, Germany 1418 (Stephan & Prilloff 2017).



WOTTEDERSCHNÄGGÄ ODER FRÖSCHÄBEY
*Was werden unsre Storgen essen,
 Wan wir die Froschen aufgefressen*

Fig. 7. Market-crier by David Herrliberger, Nr. 116: «Wotte der Schnägge oder Fröschebey—Was werden unsere Storgen essen, wann wir die Froschen aufgefressen» = «Do you want Snails or Froglegs? What shall the Storks feed on, when we eat their food?» (Herrliberger & Ulrich 1968).



Fig. 8. Froschauer Fountain, near Central Library, Zurich (© Baugeschichtliches Archiv Zürich).

- Honegger, R. E. & K. Grossenbacher. 2019. *Festschrift 40 Jahre Karch — Wie es zur Gründung der Koordinationsstelle für Amphibien- und Reptilienschutz in der Schweiz (Karch) kam*. Info fauna-cscf & karch 2019, 72 p.
- Leeman-van Elk, P. 1940. *Die Offizin Froschauer*. Orell Füssli, Zürich. 215 p.
- Leu, U. B. 2016. Conrad Gessner (1516–1565). Verlag Neue Zürcher Zeitung, Zürich. 463 p.
- Leu, U. B. 2019. Reformation als Auftrag. Der Zürcher Drucker Christoph Froschauer d. Ä. (ca. 1490–1564). *Zwingliana* 45:1–80.
- Scheuchzer, J. J. & J. A. Pfeffel. 1731–1735. *Kupfer-Bibel, in welcher die Physica Sacra oder geheiligte Naturwissenschaft derer in der heiligen Schrift vorkommenden natürlichen Sachen*. Christian Ulrich Wagner, Augspurg [sic] und Ulm, [62] 1726 p.
- Schmidt, B. 2018. Wirkung der Landschaftsveränderung auf Amphibien, pp. 199–206. In: Stuber, M. & Bürgi, M. (Eds.): *Vom «eroberten Land» zum Renaturierungsprojekt. Geschichte der Feuchtgebiete seit 1700*, Haupt Verlag, Bern.
- Stephan, E. and R.-J. Prilloff. 2017. Was landete zu Zeiten des Konstanzer Konzils (1414–1418) wirklich im Topf? Froschchenkel und Biberschwan, oder Rind, Schwein, Schaf und Huhn. *Denkmalpflege in Baden-Württemberg* 46(3):196–202.

We suggest the following format for citing this article:

Honegger 2021. The frogs of Christoph Froschauer (ca. 1490–1564), the first printer of Zurich. *Bibliotheca Herpetologica* 15(9):101–105.



Fig. 9. Froschauer-Fountain, Detail (© Baugeschichtliches Archiv Zürich).



Fig. 10. *Stumpffia froschaueri* (Crottini et al. 2020), Froschauer's Madagascar-Microhylid. (Franco Andreone ©, Zoo Zürich).



The snakes of Dante's *Inferno* and Lucanus' *de Bello Civili* (*Pharsalia*)

Jay M. Savage¹ and Brian I. Crother² *

¹ Department of Biology, San Diego State University, San Diego, California 92182-4614, savy1@cox.net

² Department of Biology, Southeastern Louisiana University, Hammond, Louisiana 70402, bcrother@selu.edu

*Corresponding author

“In the middle of the journey of our life I found myself within a dark woods where the straight way was lost.”

Thus begins the famous poem, *La Divina Commedia*, by Dante Alighieri (1265–1321 AD). That poem is generally considered to be the greatest literary work of the Middle Ages and ranks among the greatest in Western literature (Durant 1959: 1980). It consists of three parts in thirty-four Cantos (Longfellow 1867abc). It describes Dante's passage through *Inferno* (Hell), *Purgatorio* (guided by the shade of the Roman poet Virgil), and through *Paradiso* (Heaven) by Beatrice, Dante's ideal woman.

Dante (Fig. 1), who had been deeply involved in politics in his native Florence, was exiled in 1302 AD for supporting the wrong political party. He never returned to Florence but became a wanderer. However, it was during his exile that he composed the *Commedia*. Portions of this masterpiece appeared between 1308–1321 AD. The first printed versions were originally published in 1472.

Dante's *La Divina Commedia* has been translated hundreds of times into English and many times into other languages. Among the most celebrated is that credited to the French artist Gustave Doré (1832–1883) (Fig. 2), containing 125 plates accompanied by a translation into French by Pier-Angelo Fiorentino. Doré could not find a publisher willing to undertake the production of his masterpiece. Consequently, he self-funded its publication in three parts that appeared in 1861 (*Inferno*; Fig. 3), and 1868 (*Purgatorio* and *Pardiso*).

When Dante and Virgil begin their journey and enter the gateway to the *Inferno*, they are greeted by the admonition “All hope abandon, ye who enter in” (Fig. 4). Thereafter, they descend deeper and deeper into the underground, through the circles of hell (Fig. 5). Each circle contains the souls (shades) of specific kinds of sinners, where they are receiving punishment for their sins. It is in the eighth circle of torment, that Dante witnesses the punishment of thieves as described in Canto 24 (Fig. 6). These miscreants are attacked by an array of snakes, and some individual souls undergo hideous transformations after a serpent's bite. The punishments are repeated and there is no end to the suffering.

“And I beheld therein a terrible throng
Of serpents, and of such monstrous kind,
That the remembrance still congeals my blood”

In Canto 25 Dante describes another thief turning into a serpent over and over again (Fig. 7).

Snakes named in these Cantos include: *Chelydri*, *Jaculi*, *Pharsae*, *Cenchris* and *Amphisbaena*. Longfellow (1867a: 110), used alternate spellings: *Pharae*, *Cenchri*, *Ammhisbaena*. Also described in the *Inferno* (Canto 9) are *Cerberus* and *Alecto* (Longfellow 1867a: 38, 59, respectively).

The snakes cited in the *Inferno* are based on those described or mentioned by the Roman poet Marcus Annaeus Lucanus (AD 39–65), in his *de Bello Civili*. The poet is usually called Lucan in English. His work is often cited as the *Pharsalia*, after the site of the climactic battle in northern Greece celebrated in the poem. Lucan was at one time an associate of the Emperor Nero (37–68 AD) but they had a falling out. Lucan then became involved in a plot to assassinate Nero which was discovered and led to Lucan's suicide. Lucan composed the *Pharsalia* in his early twenties which describes the Roman civil war (49–45 BC) between Julius Caesar (100–44 BC) and his son-in-law, Pompey the Great (106–46 BC), and Cato the Younger (95–46 BC). After their loss of the battle of Pharsalia, Cato and his portion of Pompey's army escaped to north Africa. In Lucan (Riley 1853; Duff 1928), Book IX describes Cato and his men's adventures in Libya. It is in this section that Lucan characterizes or mentions an array of serpents, including those later included in Dante. Some are mythological, and others are derived from classic Greek and Roman legends or folklore.

It is from this rich lode of names that European naturalists, beginning in the 17th century, created vernacular or Latin names for a number of reptiles. In due course, many of these names morphed into generic names in the Linnean system and are now regarded as available under the International Code of Zoological Nomenclature (1999), hereafter The Code.

Integral to Lucan's poem is the mythic Gorgon, Medusa. She was one of three sisters, who had living snakes on their heads instead of hair. They were so horrible that anyone viewing one of them turned to stone. Two of the sisters were immortal, Medusa was not, and she was slain by the hero Perseus using a mirrored shield so that he did not look



Fig. 1. Dante Alighieri. Frontispiece by Gustave Doré.



Fig. 2. Portrait of Gustave Doré.

directly at her. Perseus, thereafter, donned winged boots to fly Medusa's head to King Polydectes. According to myth, when flying over Egypt some of her blood spilled onto the ground and spawned the serpents aspis and amphisbaena. Lucan presents a different version, indicating that many of the snakes mentioned in his poem are ones derived from those that adorned Medusa's head and most are said to be from Libya.

THE SERPENTS

In the following account, each snake recognized in Dante (Longfellow 1867a) and the translations of Lucan (Riley 1853 and/or Duff 1928), is listed. The characteristics of each form, if mentioned in the translations, are detailed. Slightly different supplementary material is provided in the two translations of Lucan's poem. Consequently, if no additional information is in the Riley translation, only the Duff version is cited. We have also referred to Isidore of Seville's encyclopedic, 20 volume, 448 chapter, *Etymologies*. This work was written between 615 and the early 630s AD. The first printed edition was published in 1470 (the Throop 2013 translation). Isidore's

masterpiece includes references to Lucan's *de Bello Civili*. It often supplies additional information on the snakes of Dante and Lucan, real and imaginary, which are included. Finally, the scientific name derived from the poets' descriptors and the name's current nomenclatural status is documented. Un-

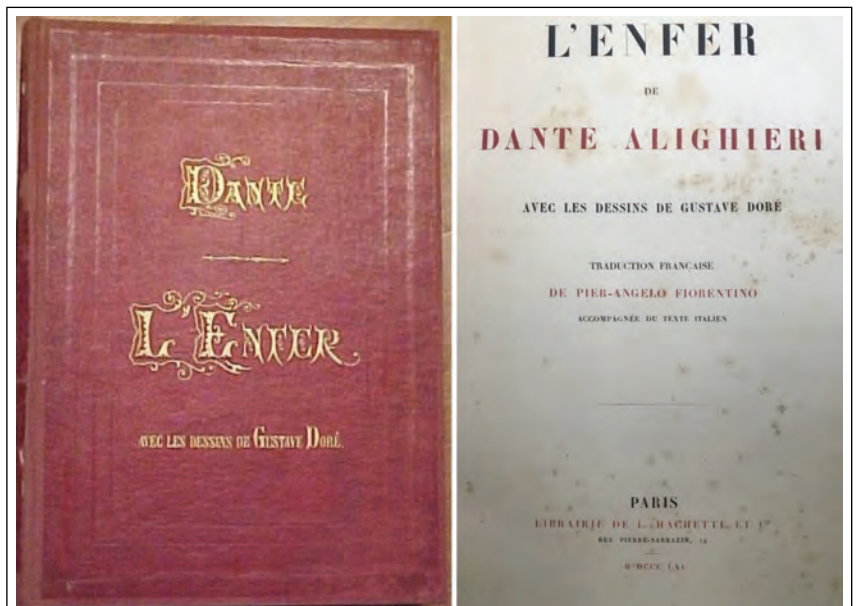


Fig. 3. Front cover and title page of the first volume of Dante's *The Divine Comedy* edition in which Doré's plates were first published.



Fig. 4. Gateway to the *Inferno*. (Canto 3, Plate 7), “All hope abandon, ye who enter in.” By Gustave Doré.

less otherwise indicated, all names have been used for genera of snakes. An asterisk (*) indicates that the bites of snakes of the currently recognized taxa are considered seriously to dangerously venomous. Note that throughout this account, the abbreviation ICZN is used to indicate authorship by the International Commission on Zoological Nomenclature (1999).

Alecto. One of the three Furies in Greek mythology, who punished moral crimes (e.g. anger), Dante (Longfellow 1867a: 52), Lucan (Riley 1853: 243, 298). Origin of the generic name *Alecto* Wagler, 1830, which is preoccupied by *Alecto* Leach, 1815 (Echinodermata) and *Alecto* Lamouroux, 1821 (Bryozoa). Wagler's *Alecto* is based on a snake of the valid genus *Pseudechis* Wagler, 1830 (Family Elapidae)*.

Ammodytes (from Greek = sand + burrower). Lucan (Duff 1928: 559) characterizes it as simply a sand-colored snake. The basis for the generic name *Ammodytes* Bonaparte, 1831 (Family Viperidae)*. That name is preoccupied by *Ammodytes* Linnaeus, 1758 for a genus of teleost fish (Family Ammodytidae), and has been totally suppressed by the ICZN (1956) in Direction 56.

Amphisbaena (Latin = fabulous snake). Lucan (Duff 1928: 559) thought it to be a noxious, serpent with a head at each end of the snake-like body with bright shining eyes. Thought to be capable of moving in two ways led by one or the other of the two heads. Basis of the valid lizard generic name *Amphisbaena* Linnaeus, 1758. (Family Amphisbaenidae).

Aspis (Latin = snake). The name asp in English may refer to the viper of southwestern Europe (*Vipera aspis*) and its allies (Family Viperidae) or to some cobras of the family Elapidae. Lucan (Duff 1928: 551) states that this serpent has a swollen neck, indicating the name is based on a cobra. Isidore (Throop 2013: XII.4.11) says the name implies that it kills with a poi-

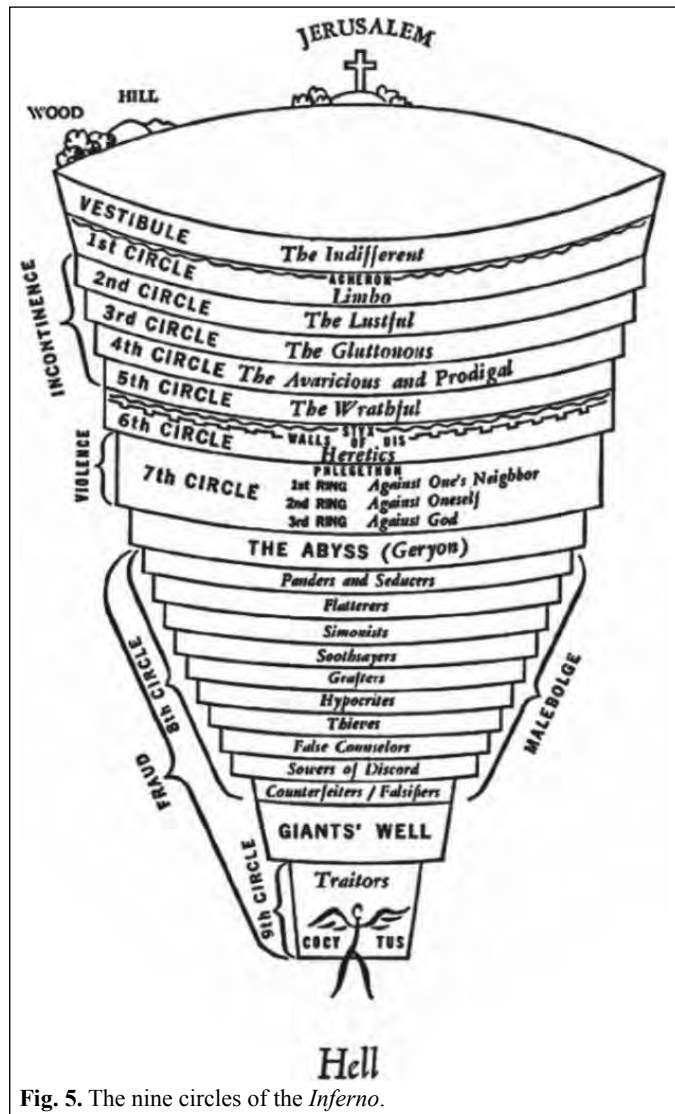


Fig. 5. The nine circles of the *Inferno*.

sonous bite. The source for the generic name *Aspis* Laurenti, 1768. That name was suppressed for the purpose of the Principle of Priority but not for those of the Principle of Homonymy. It has been placed on the Official List of Rejected and Invalid Generic Names in Zoology by action of the ICZN (1961) in Opinion 661. It is consequently, an unavailable synonym of *Cerastes* Laurenti, 1768. (Family Viperidae)*.

Basilisk (Greek = little king). This creature, according to Isidore (Throop 2013: XII.4.3), is the king of snakes as he kills other snakes with his smell. Bursts of fire from his mouth are used to kill flying birds, and Lucan (Duff 1828: 559) indicates that this snake kills with a hiss (Fig. 8). The source for the valid name of the lizard genus *Basiliscus* Laurenti, 1768. (Family Corytophanidae).

Cenchris (Greek = millet). This serpent is characterized by Lucan (Duff 1928: 599), as always crawling in a straight line, which makes it very fast moving. This description may be based on observation of rectilinear locomotion that is often



Fig. 6. Circle 8. The *Inferno* (Canto 24, Plate 48), “People were running naked and afraid.” By Gustave Doré.

used by large serpents. Apparently, its coloration is reminiscent of that of millet. The name is the basis for the generic name *Cenchrus* Gronovius 1763 and later used in an index to that work (Meuschen 1781). Both usages have been suppressed by action of the ICZN (1925) in Opinion 89 for Gronovius and ICZN (1954) in Opinion 261 for Meuschen, *Cenchrus* Daudin, 1803 is consequently, an available generic name. However the Daudin name is a junior synonym of *Agkistrodon* Palisot de Beauvois, 1799 (Family Viperidae)*. The name *Epicrates cenchrus* (Linnaeus, 1758) is also a valid name. (Family Boidae).

Cerastes (Greek = horned). According to legend (Riley 1853: 368), Helen of Troy, while eloping with Paris, stepped on the cerastes and broke its back and this is why it “sidewinds” Lucan (Duff 1928: 589) notes that it “wanders around as its spine makes it turn” It is said to have, according to different accounts, either two large horns or four small flexible ones on the head above the eyes. The name was originally used by Gronovius (1763) and later in an index to that work (Meuschen, 1781). Both usages have been suppressed by action of the ICZN (1925) in Opinion 89 for Gronovius and ICZN (1954) in Opinion 261 for Meuschen. These actions make *Cerastes* Laurenti, 1768 the valid generic name. (Family Viperidae)*.

Cerberus (Greek = doglike monster). A triple-headed hound of hell, with snakes for hair and a barbed tail. The foam from his mouth is poisonous, according to Dante (Longfellow 1857a: 38) and, Lucan (Duff 1928: 353). Basis for the valid generic name *Cerberus* Cuvier, 1829. (Family Homalopsidae).

Chelydri (Latin = land + water). A semiaquatic serpent, that, according to Lucan (Duff 1928: 558–559), when crawling on land causes the ground to smoke. The source for the valid turtle generic name *Chelydra* Schweigger, 1811. (Family Chelydridae).

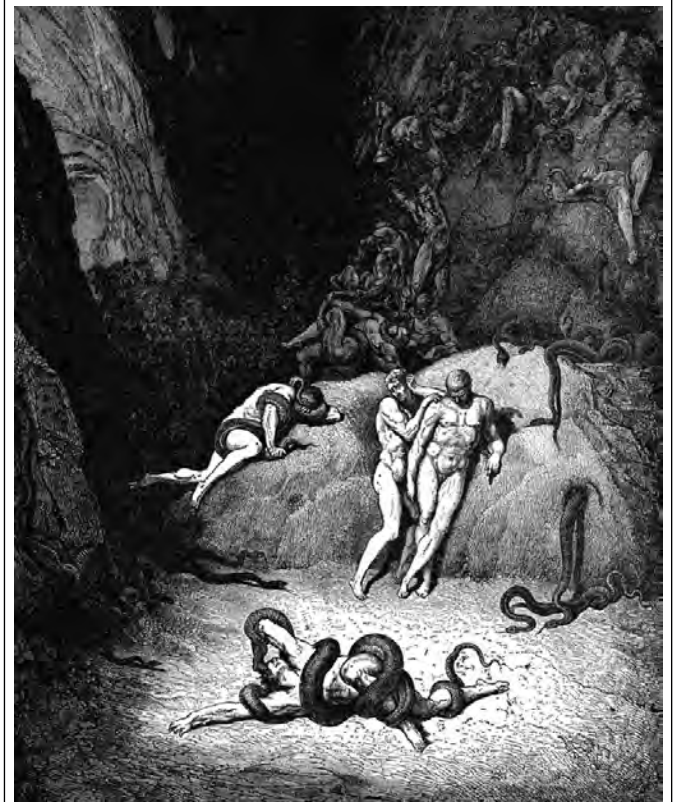


Fig. 7. Circle 8 (Canto 25, Plate 49). “The soul which to a reptile had been changed.” By Gustave Doré.

Chersydros (Latin = watersnake). According to Lucan (Duff 1928: 559), this snake is semiaquatic and inhabits the land (Libya) and the sea (Gulf of Syrtis = Sidra). The name has not been used in zoological nomenclature.

Dipsas (Greek = a kind of venomous snake = Situla in Latin). Lucan (Duff 1928:551; 559, 561), describes in detail the effect of this serpent’s bite. In essence, the victim feels no pain but only a fiery thirst that led one of Cato’s men to open his own veins to drink his own blood to no avail. Basis for the valid generic name *Dipsas* Laurenti, 1768. (Family Dipsadidae). Also, the source of the name *Zamensis situla* (Linnaeus, 1758). (Family Colubridae).

Dragon (Greek or *Draco*, Latin = giant serpent). Lucan (Duff 1928: 559) indicates that this is a giant non venomous snake. However, Isidore of Seville (Throop 2013: XI.4.4.) says it is venomous in Libya. Both authors agree that Dragons may kill by lashes of the tail. Dragons also inhale flying birds. They often coil around their prey including whole herds of bulls. Even elephants are not safe from the Dragon, who coils around their legs and kills them by suffocation.

This is not the popular image of dragons, which date in western culture from medieval stories and imagery. In this version (Fig. 9) they are more akin to giant lizards. They are complex creatures, usually depicted as having four legs, a



Fig. 8. Basilisk. Image from British Library manuscript Harley 4751 f. 59 circa 1225–1250.

serpentine tail, a pair of wings, many-fanged jaws, and horns on the top of the head. Linnaeus' usage for a rather exotic lizard reflects that concept. The valid generic name *Draco* Linnaeus, 1758, for a genus of parachuting lizards, is derived from this name. (Family Agamidae).

Other names for extant reptiles based on draco or dragon, include:

Draco Oken, 1816. The publication in which this name was proposed, is on the Official Index of Rejected and Invalid Works in Zoology, making it an unavailable name (ICZN Opinion 417, 1956). It was originally used by Oken for *Boa constrictor*, (Family Boidae) reflecting the classic usage of the name for a very large snake.

Dracaena Daudun, 1802. A valid name for a genus of lizards. (Family Teiidae).

Dracocella Gray, 1845. An available name for a genus of lizards, but it is a junior synonym of *Draco* Linnaeus, 1758. (Family Agamidae).

Dracontopsis Fitzinger, 1843. An available generic name for a genus of lizards, but it is a junior synonym of *Norops* Wagler, 1830. (Family Dactyloidae).

Draconura Wagler, 1830. An available name for a genus of lizards, currently regarded as a junior synonym of *Norops* Wagler, 1830. (Family Dactyloidae).

Draconus Rafinesque, 1815. This is an unjustified emendation of the lizard generic name *Draco* Linnaeus, 1758. (Family Agamidae).

Draconurus Thienemann, 1828. An available name for a genus of lizards but it is a junior synonym of *Dracaena* Daudin, 1802. (Family Teiidae).

Dracontura Fitzinger, 1843. An unjustified emendation of the lizard generic name *Draconura* Wagler, 1830 and a junior synonym of *Norops* Wagler, 1830. (Family Dactyloidae).



Fig. 9. Dragon. Detail of Franco-Flemish manuscript, circa 1260, via The British Library

Dracotoidis Fitzinger, 1843. An available name for a genus of lizards, but it is a junior synonym of *Draco* Linnaeus, 1758. (Family Agamidae).

Dracunculus Wiegmann, 1834. An available name for a genus of lizards, but it is a junior synonym of *Draco* Linnaeus, 1758. (Family Agamidae).

Haemorrhoids (Greek = bloodletter). According to Lucan (Duff 1828: 559, 565) a bite from this snake produces bleeding from all orifices of the body, the eyes, ears, nose, mouth and skin, even from scars. In addition, the victim's teeth and nails fall out. The source for the valid generic name *Hemorrhoids* F. Boie, 1826. (Family Colubridae).

Hypnalis (from the Greek hypnos = sleep). According to popular belief, Cleopatra committed suicide by letting a cobra bite her. This explanation is perpetuated in Shakespeare's play, *Antony and Cleopatra* (Act V, Scene II). See account of *Aspis* above. According to Isidore (Throop 2013: XII.4.11), the bite of the hypnalis produces death by sleep and was the snake responsible for Cleopatra's death. However, the scien-

tific name *Hypnale* applies to a genus of vipers not a genus of cobras. The source for the valid generic name *Hypnale* Fitzinger, 1843. (Family Viperidae)*.

Jaculus (from Latin = javelin). This arrow-headed serpent has numerous forward-pointing horns on the head. According to Lucan (Duff 1928: 567), it launches its attacks from trees, flying through the air like a javelin to pierce its victim and is not venomous. Spelled iaculus in Duff. Source of the valid mammal generic name *Jaculus* Erxleben, 1777 for a genus of jerboas. (Family Dipodidae).

Natrix (Latin = swimmer). Lucan (Duff 1928: 559) indicates that this aquatic snake poisons the waters it inhabits. Source of the valid generic name *Natrix* Laurenti, 1768. (Family Natricidae).

Ophites (Greek = a kind of snake). According to Lucan (Riley 1853: 368) this snake is the color of sand and marked with small dots resembling Theban marble. The name *Ophites* Wagler, 1830 is an available name but is a synonym of *Lycodon* Fitzinger, 1826. (Family Colubridae).

Pareas (Latin = a kind of snake). It is said by Lucan (Duff 1928: 559) to move with the body vertical to the ground. This is apparently because it has two small legs at the base of the tail (Riley 1853: 368). Most readers of the present account, will immediately realize that the “legs” are actually based on observations of the paired hemipenes of male snakes. During copulation, one of the hemipenes is used at a time. However, under extreme uncton, as when being beaten to death, both penes will be extruded. Basis for the valid generic name *Pareas* Wagler, 1830. (Family Pareidae). Also, the basis for the valid generic name *Parias* Gray, 1849. (Family Viperidae)*.

Prester (Latin = inflater). A venomous asp, whose bite is scorching. According to Lucan (Riley 1853: 368; Duff 1928: 565), once bitten, the venom then courses through the victim. It causes the entire body to swell, inflating and bloating until it bursts like a punctured balloon. Name not used in zoological nomenclature.

Python (Greek = a mythical snake). According to Lucan (Duff 1928: 245, 335), it is the largest of serpents. Basis for the valid name *Python* Daudin, 1803. (Family Pythonidae).

Scytale (Greek = cudgel). The name probably refers to its overall morphology emphasizing its proportionally large head. Lucan (Duff 1928: 589) notes that it is the only snake that “can shed its skin while the rime (= frost) is on the ground.” Isidore of Sevilla (Throop 2013: XII.4.19). The name *Scytale* was originally used by Gronovius (1763) and later in an index to that work (Meuschen 1781). Both usages have been suppressed by action of the ICZN (1925) in Opinion 89 for Gronovius and ICZN (1954) in Opinion 261 for Meuschen. Consequently, *Scytale* Latreille in Sonnini and Latreille, 1801 is an available name.

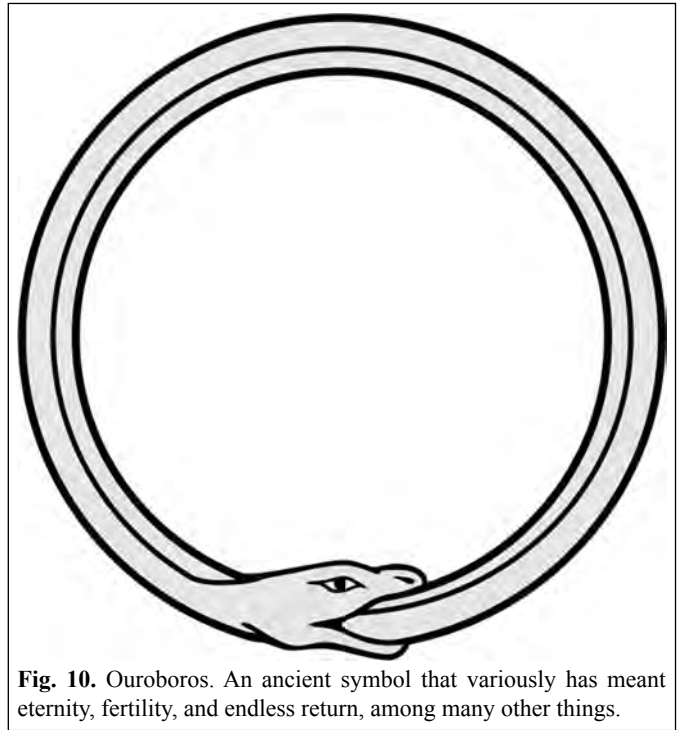


Fig. 10. Ouroboros. An ancient symbol that variously has meant eternity, fertility, and endless return, among many other things.

However, it is a junior synonym of *Boa* Linnaeus, 1758. (Family Boidae).

Seps (Greek = serpent). The bite of this snake dissolves both the flesh and bones of its victim according to Lucan (Duff 1928: 559). Riley (1853: 758) states that the name derived from the verb to putrefy, Isidore (Throop 2013: XII.4.31) Source for the available lizard generic name *Seps* Laurenti, 1768, which is a junior synonym of *Lacerta* Linnaeus, 1758. (Family Lacertidae).

Vipera (Latin = adder). This snake, as its name implies, is viviparous. Because most other snakes are oviparous, Isidore (Throop 2013: XII.4.3) characterizes that feature as “the offspring not waiting for nature’s timely resolution, gnaw her sides and burst out with force” which is fatal to the female. Lucan (Duff 1928: 341), mentions the broken body, presumably of the female, in his account of this species. The basis for the generic name *Vipera* which was originally used by Gronovius (1763) and later in an index to that work (Meuschen 1781). Both usages have been suppressed by action of the ICZN (1925) in Opinion 89 for Gronovius and ICZN (1954) in Opinion 261. Consequently *Vipera* Laurenti, 1768 stands as a valid generic name. (Family Viperidae)*.

CONCLUSION

The source of the scientific names of snakes (and some lizards) described by Lucan and included in Dante’s *Inferno* date back for nearly three millennia. They are derived from early Greek mythology, Homer’s the *Illiad*, Roman mythology, and traditions of the Middle Ages. Of these names, seven-

teen are valid and in current use, twelve are available but not valid, two are unavailable, and two are preoccupied and not available. For the names based on draco or dragon, two are valid and in use, seven are available, and two are unavailable.

Serpents are ancient mythological symbols and have represented both good and evil, among other interpretations. The iconography of snake symbols in Dante and Lucan appears uniformly frightening, if not evil. Duff (1928: xiii) is explicit about Lucan's purposes, "It appears that his purpose is less to charm his readers than to startle them and make their flesh creep." Snakes served the same purpose for Dante (Canto 24).

"And I beheld therein a terrible throng
Of serpents, and of such a monstrous kind,
That the remembrance still congeals my blood."

Unfortunately for snakes, their reputation remains dark and negative among Western cultures. Among others (eg. Chinese, African, and Native American), they represent fertility, wisdom, and good fortune among other positive characteristics (e.g. Fig. 10). Fortunately, in the west their reputation has been slowly, but consistently, on the rise as they are more and more recognized as important links as carnivores in temperate and tropical ecosystems. Far cries from the traditional negative view long prevailing in the west.

REFERENCES

- Alighieri, D. 1472. *La Commedia*. Foligno: Johann Neumeister & Evangelista, Italy. 252 p.
- Doré. G. 1861. *L'Inferno*. Pier-Angelo Fiorentino (translator). Hachette, Paris. 75 plates, [iv], 184 p.
- Doré. G. 1868. *Purgatorio & Paradiso*. Pier-Angelo Fiorentino (translator). Hachette, Paris. 408 p., 60 plates.
- Duff, J. D. 1928. *Lucan the civil war (Pharsalia)* with an English Translation. William Heinemann & Harvard University Press, London & Cambridge. 641 p.
- Durant, W. 1959. *The age of faith. A history of Medieval civilization-Christian, Islamic, and Judaic-from Constantine to Dante: A.D. 325-1300*. Simon and Schuster, New York. 1106 p.
- Gronovius, L. T. 1763. *Zoophylacii Gronovianii fasciculus primus exhibens Animalia Quadrupede, Amphibia atque Pisces, quae in Museo suo adservat, rite examenavit, systematice disposuit, descripsit, atque iconibus illustravit*. Theodorum Haak, Leiden. 236 p.
- International Commission of Zoological Nomenclature. 1961. *International Code of Zoological Nomenclature*. International Trust of Zoological Nomenclature. Fourth edition. London, U.K.
- International Commission of Zoological Nomenclature. 1999. *International Code of Zoological Nomenclature*. International Trust of Zoological Nomenclature. Fourth edition. London, U.K.
- International Commission on Zoological Nomenclature. "1924", 1925. Opinion 89. Suspension of the rules in the case of Gronow 1763, Commerson 1803, Gesellschaft Schauplaz 1775 to 1781, Catesby 1771, Browne 1789, Valmont de Bomare 1768 to 1775. *Smithsonian Miscellaneous Collections*. 73(3):27-33.
- International Commission on Zoological Nomenclature. 1954. Opinion 261. Rejection for nomenclatorial purposes of the Index to the *Zoophylacium Gronovianum* of Gronovius prepared by Meuschen (F. C.) and published in 1781. *Opinions and Declarations of the International Commission on Zoological Nomenclature*. 5:281-296.
- International Commission on Zoological Nomenclature. 1956. Opinion 417. Rejection for nomenclatorial purposes of volume 3 (Zoology) of the work by Lorenz Oken entitled "Oken's *Lehrbuch der Naturgeschichte*" published in 1815-1816. *Opinions and Declarations of the International Commission on Zoological Nomenclature*. 14:1-42.
- Longfellow, H.W. 1867a. *The divine comedy of Dante Alighieri (Inferno)* translated by Henry Wadsworth Longfellow, Vol. 1. Ticknor and Fields, Boston. 414 p.
- Longfellow, H.W. 1867b. *The divine comedy of Dante Alighieri (Purgatorio)* translated by Henry Wadsworth Longfellow, Vol. 2. Ticknor and Fields, Boston. 410 p.
- Longfellow, H.W. 1867c. *The divine comedy of Dante Alighieri (Paradiso)* translated by Henry Wadsworth Longfellow. Vol. 3. Ticknor and Fields, Boston. Vol. 3, 452 p.
- Meuschen, F. C. 1781. *Index continens nomina generica specierum propria, trivialia ut et synonyma*. 19 unnumbered pp *In Gronovius, L. T. 1763-1781. Zoophylacium Gronovianum*. Theodorum, Haak, Leiden.
- Riley, H.T. 1853. *The Pharsalia of Lucan*, London: Literally translated into English prose, with copious notes. H. G. Bohn, London. 427 p.
- Throop, P. 2013. *Isidore of Seville's Etymologies: The complete English translation of Isidori Hispalensis Episcopi Etymologiarum sive Originum Libri xx, Medieval MS*. Charlotte, Vermont. Vol. 2. Book XII, IV Serpents: 43 paragraphs.

We suggest the following format for citing this article:

Savage, J. M. and B. I. Crother. 2021. The snakes of Dante's *Inferno* and Lucanus' *de Bello Civili (Pharsalia)*. *Bibliotheca Herpetologica* 15(10):106-112.

Book Review

The Last Turtlemen of the Caribbean. Waterscapes of Labor, Conservation, and Boundary Making.

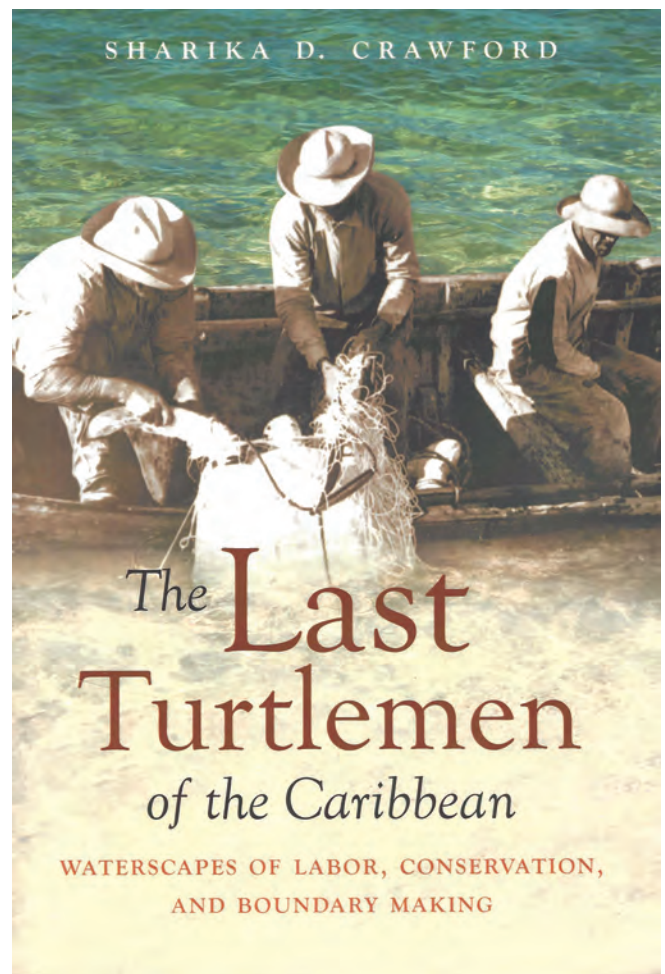
Sharika D. Crawford, 2020. Chapel Hill, North Carolina (University of North Carolina Press), xii, 204 p. \$95.00 (hardcover, ISBN 9781469660202), \$27.95 (paperback, ISBN 9781469660219), and \$21.99 (ebook, ISBN 9781469660226)

C. Kenneth Dodd, Jr.

Florida Museum of Natural History, University of Florida,
Gainesville, FL 32611, USA. Terrapene600@gmail.com

Perhaps from the time of first human settlement along the coasts and islands of the Caribbean, the Green Turtle (*Chelonia mydas*) has been a source of sustenance. Its eggs were obtained easily along the sandy shorelines, and its meat has been much sought after by coastal peoples worldwide. As an added advantage, the shell and bones could be used as utensils and carved as tools. Although not as tasty as Greens, Hawksbill Turtles (*Eretmochelys imbricata*), too, oviposited protein-rich eggs on the remote islands, and their beautiful shell has been desired by craftsmen through the ages in all parts of the world. When European imperial fleets, pirates, traders, and slavers entered the Caribbean, they found an “inexhaustible” supply of food in Green Turtles for their long voyages and to feed crews, workers, and slaves on land. Hawksbill scutes offered a further lucrative trade item. But the turtle populations were not inexhaustible, and nesting areas of former abundance, particularly in Bermuda, the Cayman Islands, and the Dry Tortugas, were decimated.

The Cayman Islands had abundant turtles but few other resources. The mahogany forests were quickly felled by the British, and the rocky soils were largely unsuitable for large-scale agriculture and difficult to clear. Sea-island cotton soon exhausted what nutrients there were. Because sugar cane was not suitable in the Caymans, the development of a large slave-based plantation system never developed, although slaves had been imported to fell trees and clear the land. When Britain ended slavery in 1807, there were few means for freed slaves and other residents to make a living on the islands. Although turtles had always been harvested locally, Cayman populations had essentially disappeared from overharvest by that time. Coupled with a lack of resources and economic opportunities on land, this forced the islanders to rely increasingly on turtling and other marine resources throughout the southern Caribbean. *The Last Turtlemen* is not about turtles *per se*, but about the effects of the Caymanian turtle fishery on the peoples and affected nations throughout the southern Caribbean Basin. As the author notes, the intention of the book is to “chronical the decline of Caymanian turtle fishing from the last decades of



the nineteenth century into the late twentieth century.” The interaction between the fishermen and indigenous communities, especially along the Central American coast, had profound effects on local economies, cultural exchange, and even national identities that persist today within this far-flung region despite the near extinction of many turtle populations and the cessation of international trade.

The book is organized into five chapters plus an introduction. The introduction provides an overall view of the turtlemen of the Cayman Islands, the region and its history, and a brief summary of the book's organization and the information the author intends to convey. Chapter 1 explores the basic biology of sea turtles, the interrelationship between turtle fishing and the indigenous peoples of southern Cuba and the vast area south of the Cayman Islands through coastal Nicaragua, Costa Rica, and Panama, and the unrestricted trade in natural resources that ultimately shaped the development of marine resource exploitation. Chapter 2 examines how the Caymanians adapted to resource exploitation, both terrestrial and marine, and moved onward and outward developing novel means to harvest turtles throughout an expanding sphere of influence. The expansion to long-distance turtling led to increased contacts among the diverse cultures inhabiting coastal Central America, particularly among freed African slaves, foreign-based traders, and indigenous communities from Honduras to Panama (Chapter 3). As a result of increasing contacts and conflicts, especially tracking a largely unregulated harvest of an increasingly depleted resource through disputed territorial waters, the turtle fishery facilitated the implementation of multi-national regulations regarding territorial boundaries (Chapter 4) and, later, to conservation efforts to prevent the decline of turtle populations (Chapter 5). The book ends with a conclusion, but more about that later. Much of the regulation resulted not from concern about turtle populations (indeed, there was precious little concern about turtles), but about political considerations regarding access to exploitation and delimitation of national boundaries.

The Introduction (*Navigators of the Sea*) sets the stage for much of the material that follows, but it notes that, despite the book's title, "the turtlemen's story – hunting sea turtles – is fascinating, but it is only part of a much broader story." Instead, this 14-page prequel sets the stage for an examination of how turtling formed a major foundation for geopolitical interaction and macroeconomic changes in the southern Caribbean. There really was little interest in the turtles themselves from government entities, and one gets the impression that even the Caymanians had little interest or incentive to worry about the status of turtle populations. As long as they could go somewhere else and exploit turtles, so be it. As a result, maritime boundaries and spheres of influence were redrawn, sometimes enforced by the might of the British imperial navy. As time went on, local indigenous communities and Caribbean nations made increasing attempts to assert national sovereignty over marine resources, feeding grounds, and offshore but sometimes far distant islands. International claims are debated to this day.

Chapter 1 (*Sages of the Sea, Turtles of the Greater Caribbean*) was the most disappointing chapter in the book. The author is not a biologist, so perhaps there should be some leniency for the many errors and awkward language that simply are not accurate. For example, Greens and Hawksbills do not have "a natural wanderlust" as they "circumnavigate

the tropical and subtropical pelagic waters around the globe." Mating frequently occurs at the surface of the water, and sea turtles do not copulate ashore; there are different species of sea turtles, not "varieties," and they are not "cold-blooded;" they are in the Order Testudines, not the "genus *Testudines*;" "circumglobal" does not mean that turtles (all?) do not spend their entire life cycle in the waters of a single country; flowers (in addition to plants ?) do not occur in seagrass beds; Kemp's Ridley does not have its major nesting site in the Yucatán; the attractiveness of Hawksbill scutes is not because they are made of keratin (all turtle scutes are made of keratin; Hawksbill scutes are thick and malleable making them ideal for fashioning inlays and jewelry); Hawksbills do not become "pregnant;" a vegetarian diet is not an unusual feature among (all ?) turtle species; and on and on. After reading this section, I was ready to throw in the towel. The author acknowledged assistance from the University of Florida Center for Latin American Studies, but she should have consulted the Archie Carr Center for Sea Turtle Research across campus. Fortunately, the rest of the chapter (a recounting of sea turtles in the history of exploration and imperial expansion in the Caribbean, other turtling indigenous communities, and the establishment of international markets) had a much more historical bent, was better written, and was far more informative. Clearly, these latter subjects are the author's forté.

Chapter 2 (*Out to Sea, Labor and the Caymanian Turtle Fishery, 1880s–1950s*) explains how Caymanian turtlers developed novel methods of catching turtles (e.g., by using numerous long nets with decoys and developing special turtle-hunting catboats [see Smith 1985] and schooners; Fig. 1) instead of jumping on swimming turtles or striking them with harpoons from canoes, methods employed by indigenous peoples. Coupled with domestic and multinational capital investment and marketing for varied products (e.g., oil, shell, powdered turtle tablets for making soup), these innovations turned the Caymanians from "itinerant turtlemen into an industry with an expansive global reach." Green Turtle, in particular, became a menu item in the distant cities of England and the United States, with turtle schooners reporting ca. 150 Greens per typical voyage in the early decades of the 20th Century. By the 1930s, Thompson Enterprises, the third largest employer in the United States, could hold several thousand Green Turtles for slaughter for up to a year in its kraals in Key West. Turtling was indeed a big business. Unfortunately, as Crawford notes, the monetary rewards of this lucrative trade rarely were passed down to the crews who shouldered the dangerous sea voyages, what with unscrupulous boat captains and a form of marine sharecropping by investors and merchants on land; crews often were paid nothing for their efforts.

Chapter 2 is also when the book really starts to get depressing for a turtle biologist. The sheer volume of the capture and extensive areal extent of turtling begins to make one wonder why there are any sea turtles left in the Caribbean. Coupled with the slaughter was the waste associated

with “the product.” Many turtles died before market, and Crawford notes that Moore & Company, the largest turtle cannery in the United States in 1938, only used about 30% of the meat. In addition to this waste, the author recounts, without comment, the story that Hawksbills had their scutes removed by indigenous peoples and some turtlemen while alive, then were “returned to the ocean, temporarily or permanently disfigured but alive.” This illusion may have been the outcome in the minds of those involved. Hawksbills had their scutes pried off, often after heating over a fire, and were thrown back into the water, but survival was short-lived. A turtle could not live long after such trauma, and there was nothing humane in this practice and, indeed, in anything about turtling. As with Chapter 1, there are some annoying errors when writing about turtle biology: the Green Turtle is not the largest marine reptile, and Hawksbills are not “impregnated.”

Chapter 3 (*A Contact Zone, Mobility, Commerce, and Kinship in the Western Caribbean, 1850s–1940s*) explores the regional effects of Caymanian turtling prior to World War II. The lack of economic opportunity on land increasingly spurred Caymanians to turtling, with as much as 12% of the population involved in the industry. Far-flung sea voyages to the Mosquito Coast and Panama brought these very different cultures into contact, resulting in cultural exchange, increased trade, sharing of turtling information, inter-marriage, and, eventually, conflict over exploitation rights. I was surprised there was not more violence among the different nationalities over fishing rights. What also struck me was, quite frankly, the audacity of the Caymanian turtlers to think they had the right to exploit marine sources in the literal backyards of far-away nations and peoples, without interference. They had already brought sea turtle populations to near extinction in southern Cuba, the Caymans, and the Tortugas, and they, with the tacit blessing of imperial England (the Caymans have been a British overseas territory since 1670), just simply thought they could move on and turtle anywhere they wanted without regard for the indigenous population or status of the turtle stocks. Crawford doesn’t address this attitude anywhere directly, but it certainly lurks in the background of Chapters 3–5.

Chapter 4 (*Limits at Sea, State Claims, Territorial Consolidation and Boundary Disputes, 1880s–1950s*) delves extensively into what happened when Caymanian turtlers attempted increasingly to extend their fishing rights throughout the often-disputed territorial waters of the Central American coast and Cuba. As might be expected, the nations of the Ca-

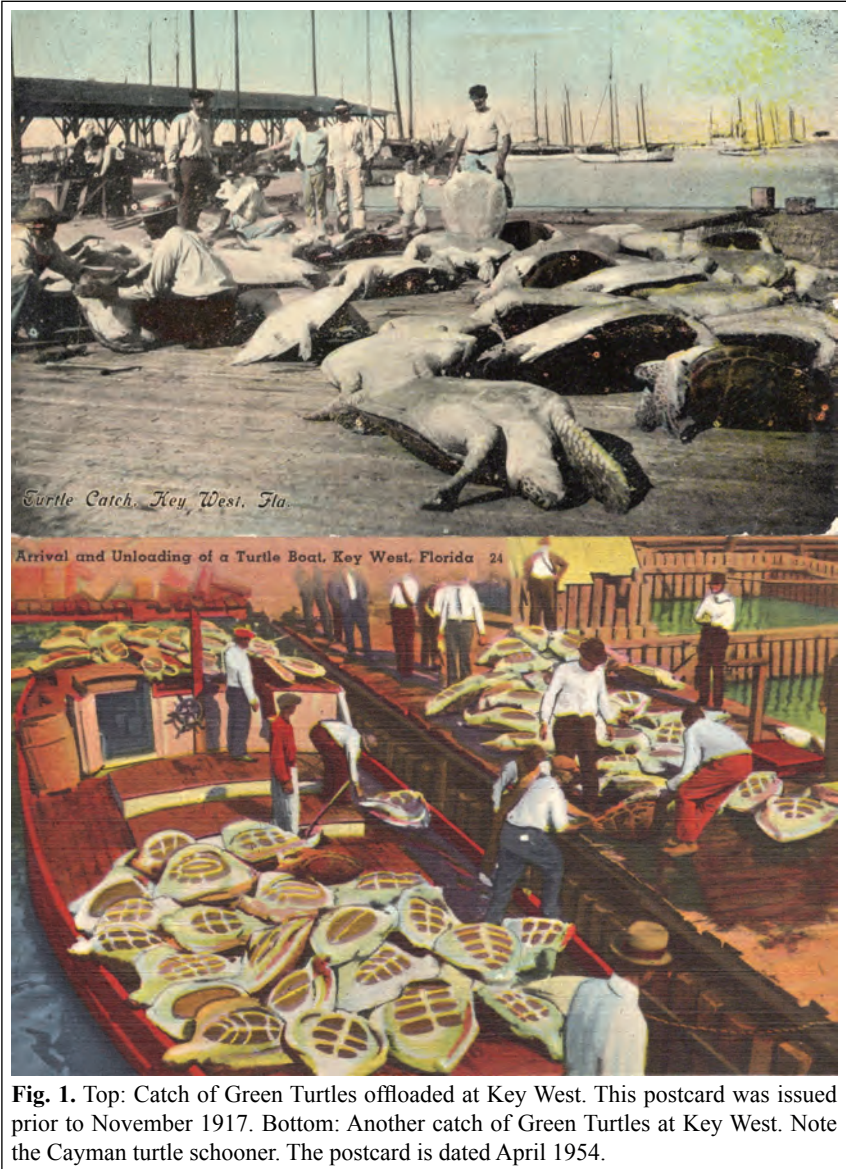


Fig. 1. Top: Catch of Green Turtles offloaded at Key West. This postcard was issued prior to November 1917. Bottom: Another catch of Green Turtles at Key West. Note the Cayman turtle schooner. The postcard is dated April 1954.

ribbean (Cuba, Honduras, Nicaragua, Costa Rica, Panama, Colombia), who had their own turtlers and marine claims to the shallow offshore banks, seagrass beds, and even remote islands, were not too thrilled when Cayman turtlers from the distant north competed with indigenous peoples for the turtle resource. The results were legal disputes, official confrontations, attempts to resolve conflicts through treaties, the development of multinational cooperation pacts, and sometimes hard feelings toward the interlopers, who were backed by the British Empire. Today’s international maritime boundaries and claims of sovereignty largely were foraged over questions of who had access in which areas for the purpose of exploiting Green and Hawksbill turtles. Some of these disputes have extended into the 21st Century, as discussed by Ankersen et al. (2015), a citation not referenced by Crawford.

Chapter 5 (*Save the Turtles, The Rise of Sea Turtle Conservationism, 1940s–1970s*) focuses on the era after World War II. Many events combined to shape these decades re-

garding turtling, not all of them the result of declining sea turtle populations: the increasing control by Central American nations over their offshore marine resources, particularly the assessment of taxes and fees on foreign turtlers and fishermen; the scarcity of fuel and manpower during the war; increased economic opportunities for Cayman Islanders elsewhere; and a shift from marine resource exploitation to international tourism as a dominant sector of the islands' economy. On top of that, the turtle populations *were* declining precipitously. Crawford discusses the great influence of Archie Carr's research and popular writing, especially in the books *The Windward Road* (1956) and *So Excellent a Fish* (1967), that called attention to the turtles' plight. She reviews early conservation efforts, particularly the establishment of "The Brotherhood of the Green Turtle" and the U.S. Navy's role in funding turtle research and conservation as the Navy sought to understand the Green Turtle's ability to navigate the ocean's waters. Unfortunately, multinational conservation cooperation in the 1970s proved elusive as certain government officials received international funding to develop a commercial export industry in Nicaraguan turtle products.

Carr was a pioneer scientist in that he was at home in the villages of the Caribbean and he respected and sought to understand local peoples and their knowledge of sea turtles; he literally spoke their language (both dialectal English and Spanish). He also could carry out innovative and scientifically sound technical research and be at home in academic and government circles, and he was never confrontational. His legacy, of course, cannot be overstated in the annals of conservation science (Davis 2007), despite the failure of Caribbean nations often to effectively come to terms with the status of their sea turtle populations. Recent data suggest increases in numbers and at least partial recovery in some populations of Green and Hawksbill Turtles, even in the Caymans (Blumenthal et al. 2021), which is certainly a result of Archie's and his students' commitment to turtle conservation. Still, harvest and poaching has continued into recent decades (e.g., Garland and Carthy 2010; Lagueux et al. 2014, 2017; Mejías-Balsalobre et al. 2021), although regional and local efforts are making inroads in sea turtle protection along the Mosquito Coast and southwards (Smith and Otterstrom 2009; Ankersen et al. 2015). It is fitting that Crawford recounts Archie's fundamental role in the saga of Caribbean turtling.

The last part of *The Last Turtlemen* (*Conclusion, Great Links of Chain*) is somewhat like the *Introduction*. Whereas the *Introduction* tells the reader what the author wants to get across in the book, the *Conclusion* tells us how the author apparently feels about how well she accomplished her goals. I found this section (p. 143–150) rather distracting and self-congratulatory. It reminded me of what a grad student might include in a thesis to ensure her committee got the point. A summary or conclusion would have been much more effective without the frequent use of "I." The author did a good job overall of demonstrating the importance of the Caymanian

turtle fishery in shaping much of the socio-economic-geopolitical nature of the southern Caribbean. Leave it at that.

As one can tell, *The Last Turtlemen* covers much important information, most of which might be surmised if one is familiar with the region and its fauna, history, and peoples. Be aware, however, that this is not fully a book about sea turtles, nor even about the lives of the Caymanian turtlers. Despite my concerns regarding the presentation of biological information on sea turtles, Crawford has done an excellent job of synthesizing a wealth of non-biological information on turtling from many sources (the book has extensive notes and a comprehensive bibliography from pp. 151–191). To truly understand the Caribbean turtle fishery – its history and long-term impacts – I would start with first-hand accounts of turtling (Duncan 1943; Matthiessen 1967, 1975), proceed to the popular works of Carr and accounts of his research, students, and interactions with turtlers throughout the Caribbean Basin (Carr 1956, 1967; Ake 2013), add background on the turtlers of the Miskito Coast (Nietschmann 1973, 1979), follow the saga of Green Turtle conservation (Rieser 2012; this book gives a much better overview of Green Turtle biology), and finish up with Crawford's *The Last Turtlemen*. Only then can one understand the complex interactions between humans and turtles in the Wider Caribbean and prospects for turtle populations in the future.

In the early 1970s, increasing demand for conservation of the Caribbean (and international) sea turtle populations, coupled with changing economics in the Cayman Islands and fewer and fewer turtlemen (due to advancing age and a lack of dependable crewmen), ended the era of the Caymanian turtle seafarers. CITES and the U.S. Endangered Species Act shut down nearly all international markets, shifting the Cayman government and private investors to focus on an eventually unsustainable commercial attempt to "farm" sea turtles (reviewed by Rieser 2012, but see Dodd 2012; now the Cayman Turtle Centre focusing on conservation and education). Intense lobbying efforts, legal challenges, and assertion of political influence that sought to override domestic law and international treaties eventually failed, and the important role of sea turtles in shaping Cayman Island and Caribbean culture now is largely recounted as history. In that regard, *The Last Turtlemen* represents an important contribution to understanding the region and in showing how an isolated and little-known island culture had dramatic regional influence on both distant societies and the marine environment. Sharika D. Crawford is an Associate Professor of History at the U.S. Naval Academy.

REFERENCES

- AKE, A. 2013. *Turning Turtles In Tortuguero*. Edgemark Press, Lynn Haven, Florida. 144 p.
- ANKERSEN, T.T., G. STOCKS, F. PANIAGUA, AND S. GRANT. 2015. Turtles without borders: the international and domestic law basis for the shared conservation, management, and use of sea turtles in

- Nicaragua, Costa Rica, and Panama. *Journal of International Wildlife Law & Policy* 18:1–62.
- BLUMENTHAL, J.M., J.L. HARDWICK, T.J. AUSTIN, A.C. BRODERICK, P. CHIN, L. COLLYER, G. EBANKS-PETRIE, L. GRANT, L.D. LAMB, J. OLYNIK, L.C.M. OMEYER, A. PRAT-VARELA, AND B.J. GODLEY. 2021. Cayman Islands sea turtle nesting population increases over 22 years of monitoring. *Frontiers in Marine Science* 8:663856.
- CARR, A.F. JR. 1956. *The Windward Road*. Alfred A. Knopf, New York. xvi, 258 p.
- CARR, A.F. JR. 1967. *So Excellent A Fishe*. The Natural History Press, Garden City, New York. 248 p.
- DAVIS, F.R. 2007. *The Man Who Saved Sea Turtles. Archie Carr and the Origins of Conservation Biology*. Oxford University Press, New York. xv, 312 p.
- DODD, C.K., JR. 2012. [Book Review] The Case of the Green Turtle. An Uncensored History of a Conservation Icon, by Alison Rieser. *Herpetological Review* 43(3):501–503.
- DUNCAN, D.D. 1943. Capturing giant turtles in the Caribbean. *National Geographic* 84(1943):177–190.
- GARLAND, K.A., AND R.R. CATHY. 2010. Changing taste preferences, market demands and traditions in Pearl Lagoon, Nicaragua: a community reliant on Green Turtles for income and nutrition. *Conservation & Society* 8(1):55–72.
- LAGUEUX C.J., C.L. CAMPBELL, AND S. STRINDBERG. 2014. Artisanal green turtle, *Chelonia mydas*, fishery of Caribbean Nicaragua: I. Catch rates and trends, 1991–2011. *PLoS One* 9(4):e94667.
- LAGUEUX, C.J., C.L. CAMPBELL, AND S. STRINDBERG. 2017. Artisanal green turtle (*Chelonia mydas*) fishery of Caribbean Nicaragua: II. Characterization and trends in size, sex, and maturity status of turtles killed, 1994–2011. *Marine Biology* 164(3):60.
- MATTHIESSEN, P. 1967. To the Miskito Cay. *The New Yorker*, 28 October 1967, p. 120–152.
- MATTHIESSEN, P. 1975. *Far Tortuga*. Random House, New York. 408 p.
- MEJÍAS-BALSALOBRE, C., J. RESTREPO, G. BORGES, R. GARCÍA, D. ROJAS-CANIZALES, H. BARRIOS-GARRIDO, AND R.A. VALVERDE. 2021. Local community perceptions of sea turtle egg use in Tortuguero, Costa Rica. *Ocean & Coastal Management* 201:10523.
- NIETSCHEMANN, B. 1973. *Between Land and Water: The Subsistence Ecology of the Miskito Indians, Eastern Nicaragua*. Seminar Press, New York. xiv, 279 p.
- NIETSCHEMANN, B. 1979. *Caribbean Edge. The Coming of Modern Times to Isolated People and Wildlife*. Bobbs-Merrill, Indianapolis. xv, 280 pp.
- RIESER, A. 2012. *The Case of the Green Turtle. An Uncensored History of a Conservation Icon*. The Johns Hopkins University Press, Baltimore. xii, 338 p.
- SMITH, R., AND S. OTTERSTROM. 2009. Engaging local communities in sea turtle conservation: strategies from Nicaragua. *The George Wright Forum* 26(2):39–50.
- SMITH, R.C. 1985. The Caymanian catboat: a West Indian maritime legacy. *World Archeology* 16(3):329–336.

We suggest the following format for citing this article:

Dodd, C. K. 2021. The Last Turtlemen of the Caribbean. Water-scapes of Labor, Conservation, and Boundary Making. *Bibliotheca Herpetologica* 15(11):113–117.



Herpetological century: 100th Anniversary of the Division of Herpetology, the Zoological Institute of the Russian Academy of Sciences, St. Petersburg

Natalia B. Ananjeva^{1*} and Igor V. Doronin²

Zoological Institute, Russian Academy of Sciences, St. Petersburg 199034 Russia

^{1*}Corresponding author: Natalia.Ananjeva@zin.ru; ²Igor.Doronin@zin.ru

Abstract. In 2019 the herpetological community of Russia celebrated 100 years since establishment of the Department of Herpetology of the Zoological Museum (known as the Zoological Institute since 1931). This paper contains information about the scientists who led the department during this period, the herpetological collections housed by the Institute, the scientific fields of study and main projects of the staff, and the geographic areas in which they worked.

Keywords: 100th Anniversary, division of herpetology, Zoological Institute, St. Petersburg

Резюме. В 2019 году герпетологическое сообщество России отметило 100-летие со дня создания отдела герпетологии в структуре Зоологического музея (с 1931 года - Зоологический институт). В статье содержится информация об ученых, руководивших отделом в этот период, герпетологической коллекции, научных направлениях и географических направлениях исследований сотрудников, а также из основных проектах.

In 2019, the herpetological community of Russia celebrated several anniversaries: 120 years since the birth of Georgy Fedorovich Sukhov (1899–1942) (Георгий Фёдорович Сухов), 95 years since the birth and 10 years since the death of Ilya Sergeevich Darevsky (1924–2009) (Илья Сергеевич Даревский) and, 100 years since establishment of the Department of Herpetology in the Zoological Museum (the Zoological Institute since 1931) (Figs. 1a and 1b). A number of publications were previously devoted to the history of the department (Darevsky and Loskot 1982; Ananjeva 1998, 2005; Ananjeva and Darevsky 2004; Ananjeva and Doronin 2014, 2015, 2020). Here we focus on the main events and those facts that were previously unreported. The Zoological Museum of the Academy of Sciences (Fig. 1) employed outstanding zoologists who made significant contributions to herpetology, among them the first professional herpetologist of Russia Alexander Alexandrovich Strauch (1832–1893) (Александр Александрович Штраух). An important research collection was established, founded in the Kunstkamera of Peter the Great at the end of the 17th century. However, as in other countries, herpetology in St. Petersburg was not formally separated into an independent subdivision for a long time and was part of various administrative departments together with other classes of vertebrates. Two scientific lineages can be traced in the history of the department, replacing each other during the first half of the 20th century. Those lineages originated 1) from Alexander Mikhailovich Nikolsky (1858–1942) (Александр Михайлович Никольский) and 2) from Konstantin Mikhailovich Derjugin (1878–1938) (Константин Михайлович Дерюгин). Nikolsky was in charge of the

Department of fish, amphibians, and reptiles from 1896 to 1903 and can be considered as the founder of our modern knowledge about batrachian and reptilian faunas of Northern Eurasia and of herpetology in Russia. The Herpetological Society was created in 1991 with its headquarters in the division of herpetology and was named after him. After moving to Kharkov, Nikolsky became a professor at Kharkov University. During his professorship, he trained his student Sergey Alexandrovich Chernov (1903–1964) (Сергей Александрович Чернов), who, in turn, became the teacher of Darevsky.

Derjugin was trained as a zoologist under the influence of Nikolai Alekseyevich Zarudny (1859–1919) (Николай Алексеевич Зарудный), who was one of the first to make an expedition to Iran and Middle Asia and collect unique zoological, including herpetological material (partially processed by Nikolsky) (Ananjeva et al., 2020) and had several publications on amphibians and reptiles. Later, Derjugin devoted himself entirely to marine biology, but he was able to transfer his interest in terrestrial vertebrates to his students at St. Petersburg University. Of these, Peter Vladimirovich Nesterov (1883–1941) (Пётр Владимирович Нестеров), Sergey Fedorovich Tsarevsky (Tsarevsky) (1887–1971) (Сергей Фёдорович Царевский), and Nikolay Sergeevich Dorovatsky (1889–1984) (Николай Сергеевич Дороватовский) showed interest in herpetology.

Tsarevsky received his secondary education at the Pskov gymnasium. This fact allows us to assume that he was familiar with Zarudny, who was a lecturer there in 1892–1906. Another herpetologist and ornithologist, Nesterov, had a similar professional life. A native of Pskov and a graduate of the Pskov gymnasium, at the university Tsarevsky became



Fig. 1. A) View of Saint Petersburg Stock Exchange and Rostral Columns; in the foreground is the building of the zoological museum. 1900. Postcard produced by Carl Oswald Bulla's photo studio. **B)** Building of the Zoological Institute, Russian Academy of Sciences, Universitetskaya Embankment of the Neva River. 2012.

a student of Derjugin. He was probably heavily influenced by Zarudny, one of the best naturalists and most educated zoologists of his time. Most likely, Zarudny, having instilled in young high school students a love of studying terrestrial vertebrates, favored them to his first Pskov student, Derjugin (Doronin 2020). It was Tsarevsky who, on June 1, 1919, was appointed as the first head of the herpetology department of the Zoological Museum, which was newly separated from a common department with ichthyology. If his dismissal in 1929 as a clergyman (in parallel with the head of the Zoological Museum, he was a deacon) during the academic “purges” (ideological verifications) and the following repression had not happened (Ananjeva and Doronin 2012), most likely, the Derjugin line in the department would have continued to this day. In earlier publications on the history of the department, the year of its establishment was erroneously given as “1915.” However, in 1915 Tsarevsky, after graduating from the university, was admitted to the staff of the museum, and only four years later was the department officially organized.

Georgy Fedorovich Sukhov held a special position in the history of the department. He was educated in Kiev and began his career as a herpetologist under the guidance of ornithologist Vladimir Mikhailovich Artobolevsky (1874–1952) (Владимир Михайлович Артоболевский) (Sukhova 2015; Doronin 2015). After Tsarevsky's dismissal, Chernov and Sukhov, who had friendly relations and previous experiences together through joint expeditions, both applied for the position of head of the Department of Herpetology. Malacologist and herpetologist Vassily Adolfovitch Lindholm (1874–1935)¹ (Василий Адольфович Линдгольм) convinced Sukhov, in 1929, to apply for a position at the Zoological Museum. In 1930 another application for the position of the head of the Department of Herpetology was sent by Sergey Alexandrovich Chernov. In 1931, Chernov became the head, despite the fact that Nikolsky supported Sukhov for the posi-

tion. Shukhov worked as a guide in the museum until 1940, and took an active part in the scientific life of the department. For example, he transported the collection of the French herpetologist Louis Amédée Lantz (1886–1953) from Moscow to Leningrad. His life was cut short during the siege of Leningrad, but the tragic events of the last century did not interrupt the teacher-student line, founded by Nikolsky and now including the fifth generation of herpetologists.

The second head of the herpetology department, Chernov, a famous herpetologist, was a well-known expert in Palearctic herpetology. He conducted extensive herpetological research in the Caucasus and Tajikistan and made comprehensive biogeographic analyses of herpetofaunas of those areas. Together with other staff members of the Zoological Institute, he was evacuated to Tajikistan during the siege of Leningrad during the Second World War. The results of his research were published as a series of articles and several monographs, including a review of the herpetofauna of Armenia (Chernov 1937), Turkmenistan (Chernov 1934) and Tajikistan (Chernov 1959). The latter includes valuable taxonomic and ecological considerations as well as a chapter on biogeography with ideas about the origin of the fauna of the deserts of Middle Asia. In the last years of his life, Chernov focused on the Palearctic snakes, using, among other characters, their craniology. Pavel Viktorovich Terentyev (1903–1970) (Павел Викторович Терентьев) (Fig. 2), a well-known herpetologist, professor at Leningrad University and head of the Department of Vertebrate Zoology (1941–1942, 1954–1965), worked in the herpetological department during the Second World War and the Nazi's siege of Leningrad (1941–1944). His most famous work is a key to amphibians and reptiles of the USSR, co-authored with Chernov (with one edition in Ukrainian and three editions in Russian (Terentyev and Chernov 1936, 1940, 1949), which was translated into English (Terent'ev and Chernov 1965). These two zoologists were the country's leading herpetologists of their time. Terent'ev's main publications are devoted to the study of taxonomy and biogeography of mainly tailless amphibians, as well as ecological, biometric, and evolutionary studies.

¹W.A. Lindholm's 145-years anniversary was celebrated in 2019 with a special issue of Proceedings of the Zoological Institute RAS (Vol. 323, No. 3).



Fig. 2. Staff of the Department of Herpetology including Ph.D. students and visiting fellows. Sitting (from left to right): S. A. Chernov, L. N. Lebedinskaya and P. V. Terentjev; standing (from left to right): A. M. Alekperov, K. B. Yuriev, L. I. Khosatzky, I. S. Darevsky and G. Peters. Leningrad, November 1957.

Lev Isaakovich Khosatzky (1913–1992) (Лев Исаакович Хозацкий), a well-known zoologist-herpetologist and paleontologist began his association with Department of Herpetology in 1931. Starting in 1948 he worked as associate professor of the Department of Vertebrate Zoology at Leningrad State University and was a teacher of many zoologists, morphologists, ecologists, and herpetologists. Under the influence of Chernov, Khosatzky began to study amphibians and reptiles, retaining this scientific interest for all of his life. In 1936, he successfully defended his unpublished thesis “A critical review of the Palaearctic representatives of the genus *Natrix*.” Subsequently, fossil turtles became the main scientific focus of Khosatzky’s work (Borkin 2013).

The next head of the herpetological department after Chernov was his student, a graduate of Lomonosov Moscow State University, Ilya Sergeevich Darevsky, who worked at the Zoological Institute of the USSR Academy of Sciences (Russian Academy of Sciences) from 1962 until the last days of his long and eventful life in 2009. The discovery of natural parthenogenesis in terrestrial vertebrates and the study of the biodiversity of amphibians and reptiles in the Caucasus and other regions of Eurasia brought him worldwide fame. Many species of animals are named after him, and the rock lacertid lizards, which Darevsky studied during all his life (Darevsky 1967), were separated into a distinct genus *Darevskia* Arribas, 1999, named in his honor (Arribas et al. 2018).

The collection of the herpetological division, including more than hundred thousand (100,000) specimens of recent herps as of January 2021, is one of the largest in the world (https://www.zin.ru/collections/Amphibia/index_en.html). Its collection of nomenclature type specimens is one of the most significant among scientific institutions (Uetz et al., 2019) and continues to be regularly enriched, primarily due to descriptions of new taxa from tropical Asia. Fossils stored in the Department of Herpetology as of January 2021 include more than 300 accession numbers; most of them containing dozens or hundreds of bone fragments: more than 20 specimens are nomenclatural types. The collection

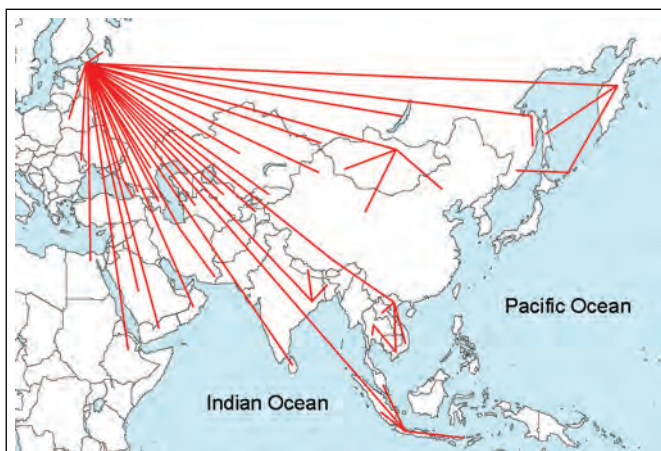


Fig. 3. Map of the main expedition routes of the staff of the Division of Herpetology.

is represented mainly by isolated bones and their fragments, but also by parts of skeletons, skulls, and rocks with impressions of bones. The collection includes remains of amphibians, turtles, ichthyosaurs, plesiosaurs, pterosaurs, dinosaurs, crocodiles, lizards, and snakes. The main part of the collection represents turtle fossil remains. The collection continues to be enlarged through regular paleontological works within Russia (the Northern Caucasus, Western Siberia, and Baikal region), Kazakhstan, and Ukraine.

Department staff have been active across practically the entire territory of the former USSR, Mongolia, and Vietnam. In addition, field studies were conducted in northern Africa (Egypt and Ethiopia) (Fig. 3). In addition, from 1982 until recently, research has continued in Southeast Asia within the framework of many projects in collaboration with herpetologists from Vietnam (National Museum of Natural History and Institute of Ecology and Biological Resources in Hanoi, Vietnam and the Academy of Science and Technology, in Hanoi), China (Institute of Biology in Chengdu, Institute of Zoology in Kunming, Chinese Academy of Sciences, China), Europe (Staatliches Naturhistorisches Museum, Braunschweig, Germany; Zoologischer Garten Köln, Cologne, Germany; University of Gothenburg, Sweden), the USA (Museum of Vertebrate Zoology, Berkeley, USA; Field Museum, Chicago, USA) and Canada (Royal Ontario Museum, Toronto). As a result of tropical research in the South and Southeast Asia, the staff of the herpetological department described five new genera of lizards and snakes and more than 100 new species of frogs, lizards, and snakes; the phenomenon of cryptic speciation has been studied and revealed using molecular genetic methods.

Today nine researchers, L. Ya. Borkin, I. G. Danilov, I. V. Doronin, L. A. Kupriyanova, D. A. Melnikov, K. D. Milto, N. L. Orlov, E.V. Syromyatnikova, and three collection managers, E. A. Golynsky, L. K. Johanssen, A. A. Ostroshabov (Table 1) work here under the leadership of the head of the division, Natalia B. Ananjeva (Fig.4). This team also involves three graduate students and four undergraduates. In the 100



Fig. 4. Staff of the Department of Herpetology after the seminar with presentation of guest lecturer Jesse Grismer (Department of Biology, La Sierra University, 4500 Riverwalk Parkway, Riverside, CA 92515, USA “Genomic solutions for difficult herpetological problems”). Standing (from left to right): J. Grismer, M. Grismer, N. **B. Ananjeva**, L. A. Kupriyanova, K. D. Milto, L. K. Johansen, M. A. Doronina, I. V. Doronin, A. N. Gnetneva, N. L. Orlov, A. A. Ostroshabov, E. A. Golynsky, D. A. Melnikov, R. A. Nazarov (Zoological Museum of Moscow University), **I. G. Danilov**, O. S. Bezman-Moseyko. St.Petersburg, November 23th, 2017. The names of the division staff are in bold.

years since its organization, the division now has the maximum number staff. In 1919 the department included limited staff, with only the head of department and one laboratory assistant. On December 1, 2020, the herpetology department received the status of a division due to the separation of the division of ornithology and herpetology into two divisions. The main projects of the staff are traditionally associated with the study of biodiversity, taxonomy, phylogeny, biogeography, speciation, and conservation strategies for amphibians and reptiles in Eurasia using a complex of modern zoological methods. Extensive paleoherpetological studies have been carried out in the division in recent decades. Activity in the field of conservation includes authorship and editing of several editions of the “Red Data Book” of the USSR, the Russian Federation and regional Red Data Books, and participation in the work of the Commissions (SSC IUCN) of the International Union for the Conservation of Nature, organization and participation in the workshops on Redlisting Assessment of different regions of Eurasia (Ananjeva and Doronin 2016) (Fig. 5).

Division staff realized several projects including the compilation and editing of global databases of amphibians and reptiles, as well as a number of scientific popular books, booklets, and articles. Successful study of methods for laboratory breeding of rare and endangered species of amphibians and reptiles is being conducted.

Since 1991, the Department of Herpetology has hosted the organizational center and presidium of the A. M. Nikolsky Herpetological Society at the Russian Academy of Sciences. This society publishes the bilingual herpetological journal *Current Studies in Herpetology* since 2000 (Fig.6) (Ananjeva and



Fig. 5. Organizers and participants of the Central Asian Redlisting Assessment SSC IUCN Workshop in the Zoological Institute, Russian Academy of Sciences, April, 2016: (from left to right) Philip Bowles (Biodiversity Assessment Unit, International Union for Conservation of Nature: IUCN, Washington D.C., USA), Monika Böhm (Institute of Zoology, Zoological Society of London, Regent’s Park, London, Great Britain), Takhir Sattorov (Tajik National University, Dushanbe, Tajikistan), Natalia B. Ananjeva (Zoological Institute, Russian Academy of Sciences, St.Petersburg, Russia), Theodore J. Papenfuss (Museum of Vertebrate Zoology, University of California, Berkeley, USA).

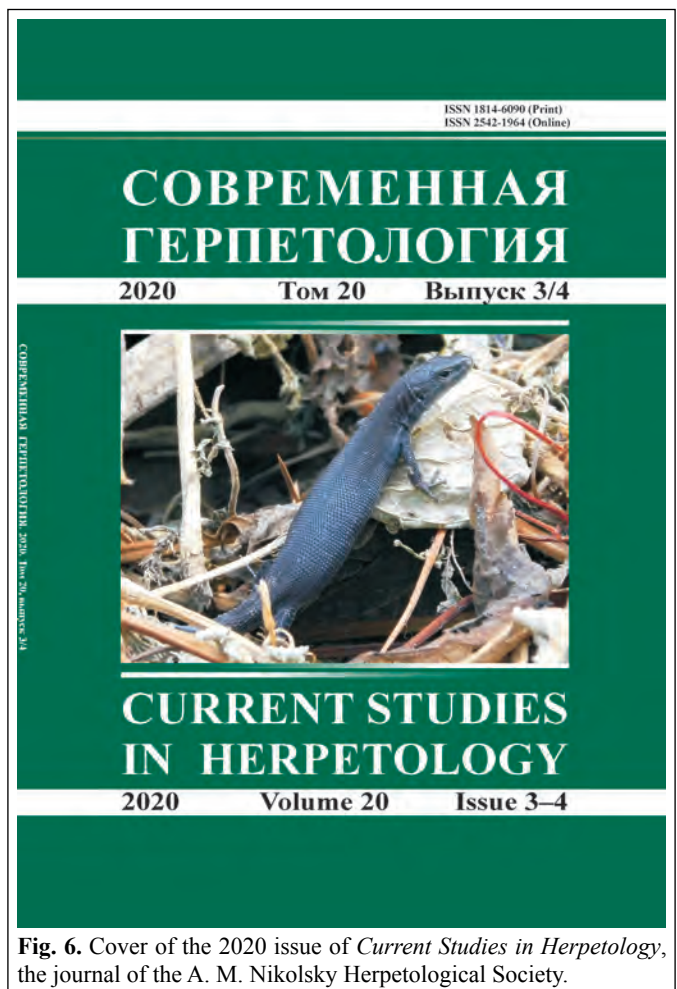


Fig. 6. Cover of the 2020 issue of *Current Studies in Herpetology*, the journal of the A. M. Nikolsky Herpetological Society.

Table 1. List of current employees of the Division of Herpetology, Zoological Institute, Russian Academy of Sciences.

Name	Academic degree, academic title	Position	Educational background	Dissertations	Research interests
Natalia B. Ananjeva	Doctor of Biological Sciences, professor	Head of Division	Leningrad State University, 1968	“Ecology-morphological analysis of five sympatric species of desert lizards of <i>Eremias</i> genus.” (PhD). “Phylogeny of agamid lizards and evolution of Palearctic agamid lizards.” (PhD habilitation)	Morphology, ecology, taxonomy, phylogeny, biogeography, speciation of amphibians and reptiles.
Leo J. Borkin	Candidate of Biological Sciences	Leading Researcher	Leningrad State University, 1971	“Systematics of brown frogs of the Palearctic Asia.” (PhD)	Herpetology, evolutionary biology, science history.
Igor G. Danilov	Candidate of Biological Sciences	Senior Researcher, Deputy Director of ZIN RAS	St. Petersburg State University, 1996	“Fossil turtles of the family Lindholmemydidae and phylogenetic relationships of cryptodiran turtles (Cryptodira).” (PhD)	Vertebrate paleontology; morphology, phylogeny, systematics and biogeography of turtles.
Igor V. Doronin	Candidate of Biological Sciences	Senior Researcher, Head of the Department of postgraduate education of ZIN RAS	Stavropol State University, 2009	“Systematics, phylogeny and distribution of Rock lizards supraspecific complexes <i>Darevskia (pratricula)</i> , <i>Darevskia (caucasica)</i> and <i>Darevskia (saxicola)</i> .” (PhD)	Systematics, phylogeny, distribution and biology of amphibians and reptiles of the Caucasus and adjacent territory, the history of herpetology.
Marina A. Doronina		PhD Student	Stavropol State University, 2009		Systematics, phylogeny, distribution and biology of lizards of the Caucasus and adjacent territory.
Eugeny A. Golynsky		Senior Collection Manager	St. Petersburg State University, 2005		Zoogeography, mapping, databases, scientific collections.
Larissa K. Iogansen		Senior Collection Manager	Leningrad State University, 1987		Zoogeography, scientific collections.
Larissa A. Kupriyanova	Candidate of Biological Sciences	Senior Researcher	Leningrad State University, 1966	“Comparative-karyotypic analysis of several lizard species of the Lacertidae and the Scincidae.” (PhD)	Cytogenetics, phylogeny, evolutionary biology, biodiversity and conservation of reptiles.
Daniel A. Melnikov		Junior Researcher	Rostov State University, 2003		Taxonomy, Systematics, Middle East, Agamids, toad headed agamas.
Konstantin D. Milto	Candidate of Biological Sciences	Senior Researcher	St. Petersburg State University, 2002	“Amphibians and reptiles of North-West Russia: biodiversity estimation.” (PhD)	Biodiversity, zoogeography, ecology, conservation of amphibians and reptiles, scientific collections.

Table 1. (Continued) List of current employees of the Division of Herpetology, Zoological Institute, Russian Academy of Sciences.

Name	Academic degree, academic title	Position	Educational background	Dissertations	Research interests
Nikolai L. Orlov	Candidate of Biological Sciences	Leading Researcher	A.I. Herzen's Leningrad Pedagogical Institute, 1985	"Fauna of amphibians of Vietnam: distribution, taxonomic and ecological diversity." (PhD)	Taxonomy, phylogeny, ecology, biogeography, conservation and zooculture of amphibians and reptiles of Eurasia, Indochina biodiversity.
Ekaterina M. Obraztsova		PhD Student	St Petersburg State University, 2015		Morphology and evolution of Mesozoic turtles.
Alexander A. Ostroshabov		Senior Collection Manager	Altai State Humanitarian Pedagogical University, Biysk, 2009		Rhacophoridae, Indochina, taxonomy, distribution, reproductive biology, larval development.
Pavel B. Snetkov		PhD Student	St Petersburg State University, 2014		Phylogeny and osteology of snakes of Asia...
Elena V. Syromyatnikova	Candidate of Biological Sciences	Senior Researcher	St Petersburg State University, 2009	"Fossil turtles of the families of Adocidae and Nanshiungchelyidae: morphology, systematics and phylogeny and distribution." (PhD)	Morphology and evolution of turtles, Cenozoic amphibians and reptiles.

**Fig. 7.** Cover of the December, 2019 issue of *Russian Journal of Herpetology*, dedicated to the 100th Anniversary of the Department of Herpetology of the Zoological Institute, Russian Academy of Sciences.

Doronin 2017). The department staff together with the Folium publishing house have been publishing the English-language herpetological journal "*Russian Journal of Herpetology*" since 1994 (Fig. 7). Special issues of the periodical *Proceedings of the Zoological Institute RAS* (2013, 2014, 2020) were dedicated to the anniversary dates associated with the memory of the outstanding herpetologists Khosatzky and Darevsky, as well as the centenary of the department.

During the period when Darevsky was a chief of department (1962–1994), a scientific school was formed (Fig. 8). A scientific school is normally understood as a scientific team united by a specific topic, a common system of views, scientific interests, and traditions that are conserved and developed during several scientific generations of professor-student relations. This term also denotes significant research, a high level of scientific results, and scientific recognition by the international community, and continuity of research, which determines the role of the leader and prospects for the school. We hope that, despite many problems of the development of science in Russia, the last point will be relevant for a long time for the St. Petersburg herpetological school and division of herpetology.



Fig. 8. Staff of the Department of Herpetology, St. Petersburg, August 1997. Standing (from left to right): N. L. Orlov, L. K. Johansen, N. B. Ananjeva, L. S. Darevsky, L. A. Kupriyanova, L. J. Borkin, K. D. Milto and A. V. Barabanov; sitting: I. G. Danilov.

We present the genealogical tree of two main scientific lineages in Department of Herpetology (Fig. 9). This scheme shows also several scientists who do not work in the department/division, but are directly related to its genealogy (Zarudny, Derjugin, Khosatzky, and Tuniyev). It is necessary to name collection managers and laboratory assistants, whose activities were and are of great value in the history of the department—these are Lyudmila Nikolayevna Lebedinskaya (1906–1989) (Людмила Николаевна Лебединская) and Larissa Kornelevna Johanssen (born 1957) (Лариса Корнелевна Иогансен).

An attempt to construct a similar scheme was previously made by Ronald Altig in the pages of “*Contributions to the History of Herpetology*” (Adler 2012). It presents the so-called “academic lines” in the field of herpetology, which to some extent correspond to our concept of a “scientific school.” These “lines” reflect the relations of teachers and

students, but the defense of a thesis was considered as a formal reference (PhD in Europe and USA or PhD in the USSR and Russia). Unfortunately, Altig’s scheme contains a large number of errors that are corrected in our Fig. 9.

The staff of the Division of Herpetology published hundreds of papers during the recent decades. Among them are following monographs published after 2000:

Ananjeva N., Orlov N., Khalikov R., Darevsky I., Ryabov I., Barabanov A. 2004. *An Atlas of the Reptiles of North Eurasia. Taxonomic Diversity, Distribution, Conservation Status*. St. Petersburg: Zoological Institute RAS. 232 p. [Russian]

Ananjeva N., Orlov N., Khalikov R., Darevsky I., Ryabov I., Barabanov A. 2006. *An Atlas of the Reptiles of North Eurasia. Taxonomic Diversity, Distribution, Conservation Status*. Sofia: Pensoft Publishers. 250 p. (Pensoft Series Faunistica 47).

Ananjeva N.B., Doronin I.V. 2015. *Ilya Sergeevich Darevsky: portrait of herpetologist. Photoalbum*. St. Petersburg: Zoological Institute RAS. 103 p. [Russian]

Danilov I.G., Syromyatnikova E.V., Sukhanov V.B. 2017. Subclass Testudinata. In: Lopatin A.V., Zelenkov N.V. (Eds.) *Fossil vertebrates of Russia and adjacent countries. Fossil Reptiles and Birds. Part 4*. Moscow: GEOS: 27–395. [Russian]

Gumprecht A., Tillack F., Orlov N.L., Captain A., Ryabov S. 2004. *Asian Pitvipers*. Berlin: Geitje Books. 368 p.

Kalyabina-Hauf S.A., Ananjeva N.B. 2004. Phylogeography and intraspecific structure of wide distributed sand lizard, *Lacerta agilis* L. 1758 (Lacertidae, Sauria, Reptilia) (case study of mitochondrial cytochrome b gene. St. Petersburg: Zoological Institute RAS. 108 p. (*Proceedings of the Zoological Institute RAS*, Vol. 302). [Russian]

Litvinchuk S.N., Borkin L. 2009. *Evolution, systematics and distribution of crested newts (Triturus cristatus complex) in Russia*

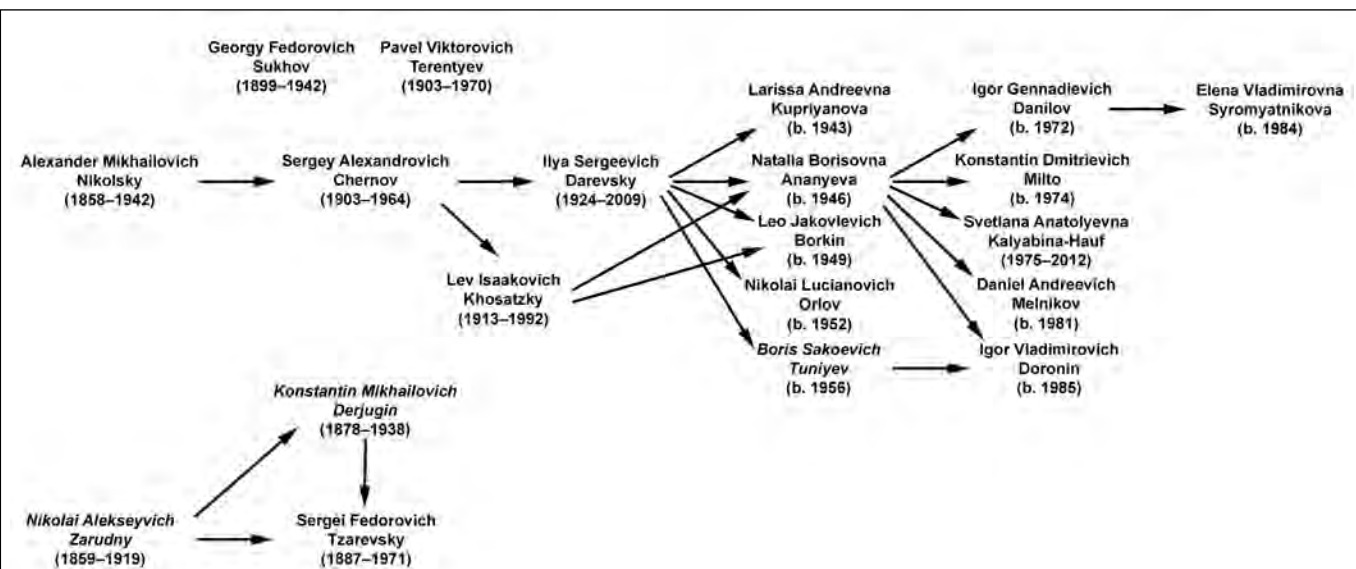


Fig. 9. Scheme of the scientific lineages within the framework of the scientific school in the Department / Division of Herpetology of the Zoological Institute of the Russian Academy of Sciences (as of early 2021). The names in italic font mark the scientists who did not work on the staff of the Zoological Museum / Institute, but are directly related to its genealogy.



Fig. 10. Participants of the Second International Conference of Young Herpetologists of Russia and Neighboring Countries, dedicated to the 100th Anniversary of the Department of Herpetology of the Zoological Institute Russian Academy of Sciences *Modern Herpetology: Problems and Ways of their Solutions*. Saint Petersburg, 25–27 November 2019.

and Adjacent Countries. St. Petersburg: Evropeisky Dom. 592 p. [Russian]

Orlov N.L., Ananjeva N.B. 2007. *Amphibians of South-East Asia*. St. Petersburg: SPSU. 270 p. [Russian]

Orlov N.L., Ryabov S.A., Ananjeva N.B., Evsyunin A.A. 2010. *Asian arboreal frogs of the genus Theloderma Tschudi, 1838 (Amphibia: Anura: Rhacophoridae: Rhacophorinae)*. St. Petersburg: Zoological Institute RAS. 52 p. [Russian]

Tuniyev B.S., Orlov N.L., Ananjeva N.B., Aghasyan A.L. 2009. *Snakes of the Caucasus: taxonomic diversity, distribution, conservation*. Moscow: KMK Scientific Press Ltd. 223 p. [Russian]

Tuniyev B.S., Orlov N.L., Ananjeva N.B., Aghasyan A.L. 2019. *Snakes of the Caucasus: taxonomic diversity, distribution, conservation*. Moscow: KMK Scientific Press Ltd. 276 p.

The 2019 International Youth Conference (Fig. 10) of Herpetologists of Russia and Neighboring Countries was organized around the theme “Contemporary Herpetology: Problems and Ways to Solve Them.” It was held on November 25–28, 2019 in St. Petersburg at the Zoological Institute of the Russian Academy of Sciences. This conference was dedicated to 100th Anniversary date of the Herpetological Department and organized by the Zoological Institute, RAS and the A. M. Nikolsky Herpetological Society. A drawing of *Pipa pipa* (Linnaeus, 1758) was chosen as the emblem of the conference (Fig. 11). This choice was not accidental; the emblem symbolizes parental care for the new generation, and the drawing itself was made from one of the first specimens stored in in our collection, bought by Peter the Great from Albertus Seba for the Kunstkamera. The conference was attended by 138 specialists from Russia, Azerbaijan, Great Britain, Armenia, Belarus, Georgia, Kazakhstan, China, Slovakia, Thailand, France, Czech Republic, Sri Lanka, and Japan. Most of the participants were young scientists who

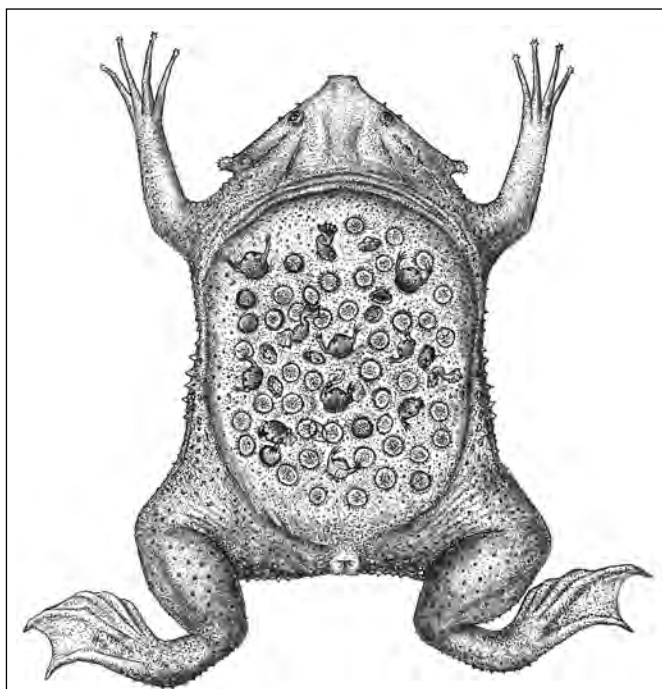


Fig. 11. The drawing of specimen *Pipa pipa* (Linnaeus, 1758) – emblem of the Second International Conference of Young Herpetologists of Russia and Neighboring Countries, dedicated to the 100th Anniversary of the Department of Herpetology of the Zoological Institute Russian Academy of Sciences “Modern Herpetology: Problems and Ways of their Solutions”. Author – A. A. Ostroshabov, 2019.

will determine the progress of herpetology in the future. For the opening of the conference, congratulations were received from foreign colleagues from Germany (Zoological Institute and Museum named after A. Koenig, Bonn), Spain (Spanish Herpetological Society), China (Institute of Biology of the Chinese Academy of Sciences, Chengdu), USA (American Society of Ichthyologists and Herpetologists), France (National Museum of Natural History, Paris) and from the editorial staff of the international database “The Reptile Database.”

The 100th anniversary is a significant date for any scientific team. It obliges to summarize the path traveled. We hope that we were able to do this short story. We really hope that further research of St. Petersburg herpetologists will be a worthy continuation of our history and will be of value for the development of world herpetology.

REFERENCES

- Adler, K. (ed.). 2012. *Contributions to the History of Herpetology. Volume 3*. Issued to Commemorate the 7th World Congress of Herpetology Vancouver 2012. Vancouver: Society for the Study of Amphibians and Reptiles, 564 p. (Contributions to Herpetology, № 29).
- Ananjeva, N. B. 1998. Department of Herpetology, Zoological institute, Russian Academy of Sciences, St. Petersburg, Russia: History and current Research. *Herpetological Review*. 29(3): 136–140.
- Ananjeva, N. B. 2005. History and Anniversary Dates of Russian Herpetology in St. Petersburg. *Herpetologia Petropolitana. Proceedings of the 12th Ordinary General Meeting of the Societas Europaea Herpetologica, 12–16 August 2003*, St. Petersburg, Russia: 5–10.
- Ananjeva, N. B. and Darevsky, I. S. [Ананьева, Н. Б. и Даревский, И. С.] 2004. [Herpetological research at the Zoological Institute of the Russian Academy of Sciences]. In the book: A. F. Alimov (Ed.). *Fundamental zoological research. Theory and methods*. KMK Scientific Publishing Association, Moscow – St. Petersburg: 27–37.
- Ananjeva, N. B. and Doronin, I. V. [Ананьева, Н. Б. и Доронин, И. В.] 2012. [Not forgotten the name of the Russian herpetology. By the 125th anniversary of S.F. Tsarevsky]. *Priroda*. (6): 86–92.
- Ananjeva, N. B. and Doronin, I. V. [Ананьева, Н. Б. и Доронин, И. В.] 2015. [*Ilya Sergeevich Darevsky: portrait of herpetologist. Photoalbum*]. ZIN RAS, St. Petersburg, 103 p.
- Ananjeva N. B. and Doronin I. V. [Ананьева, Н. Б. и Доронин, И. В.] 2016. [IUCN Red List Workshop for Central Asian reptiles (Saint-Petersburg, Russia, 4–8 April, 2016)]. *Current Studies in Herpetology*. 16(1/2): 67–69.
- Ananjeva, N. B. and Doronin, I. V. 2017. The 25th Anniversary of the Nikolsky Herpetological Society at the Russian Academy of Sciences, with a Review of its Accomplishments and Those of its Predecessor Organization, the All-Union USSR Herpetological Committee. *Herpetological Review*. 48(2): 487–492.
- Ananjeva, N. B. and Doronin, I. V. [Ананьева, Н. Б. и Доронин, И. В.] 2020. [Sergey Alexandrovich Chernov (1903–1964): biography of herpetologist]. *Proceedings of the Zoological Institute RAS*. 324(1): 7–40.
- Ananjeva, N. B., Milto, K. D., Barabanov, A. V., Golynsky, E. A. 2020. An annotated type catalogue of amphibians and reptiles collected by Nikolay A. Zarudny in Iran and Middle Asia. *Zootaxa*. 4722 (2): 101–128.
- Arribas, O. J., Ananjeva, N. B., Carranza, S., Doronin, I. V., Orlov, N. L., Orlova, V. F. 2018. Iberolacerta Arribas and Darevskia Arribas (Chordata, Squamata, Lacertidae): proposals to deem these names available either from Arribas (1997) or from Arribas (1999). *The Bulletin of Zoological Nomenclature*. 75: 122–129.
- Borkin, L. J. [Боркин, Л. Я.] 2013. [Lev Isaakovich Khosatzky (1913–1992) as a zoologist-herpetologist and paleontologist]. *Proceedings of the Zoological Institute RAS*. 317(4): 356–371.
- Chernov, S. A. [Чернов, С. А.] 1934. [Пресмыкающиеся Туркмени. Труды Каракалинской и Кзыл-Атрекской паразитологической экспедиции 1931 года и материалы по фауне Туркмени. Труды Совета по изучению производительных сил. Серия туркменская, 6: 255–289] Reptiles of Turkmenistan. *Proceedings of the Karakala and Kzyl-Atrek parasitological expeditions of 1931 and materials on the fauna of Turkmenistan. Proceedings of the Council for the Study of Productive Forces. Turkmen series*. 6: 255–289.
- Chernov, S. A. [Чернов, С. А.] 1937. [Определитель змей, ящериц и черепах Армении. Издательство Академии наук СССР, Москва–Ленинград, 55 с.] *Keys to snakes, lizards and turtles of Armenia*. Publishing house of the USSR Academy of Sciences, Moscow–Leningrad, 55 p.
- Chernov, S. A. [Чернов, С. А.] 1959. [Фауна Таджикской ССР. Т. XVIII. Пресмыкающиеся. Сталинабад, 203 с. (Академия наук Таджикской ССР. Институт зоологии и паразитологии им. акад. Е. Н. Павловского. Труды, Т. XCVIII)] Fauna of the Tajik SSR. Vol. XVIII. Reptiles. Stalinabad, 203 p. (Academy of Sciences of the Tajik SSR. *Institute of Zoology and Parasitology named after Academician E. N. Pavlovsky. Proceedings*, Vol. XCVIII).
- Darevsky, I. S. [Даревский, И. С.] 1967. [Скальные ящерицы Кавказа (Систематика, экология и филогения полиморфной группы кавказских ящериц подрода Archaeolacerta). Наука, Ленинград, 214 с.] *Rock lizards of the Caucasus: systematics, ecology and phylogeny of the polymorphic groups of Caucasian rock lizards of the subgenus Archaeolacerta*. Nauka, Leningrad, 214 p.
- Darevsky, I. S. and Loskot, V. M. [Даревский, И. С. и Лоскот, В. М.] 1982. [Laboratory of Ornithology and Herpetology]. In the book: O. A. Scarlato (Ed.). *Zoological Institute. 150 years old*. Nauka, Leningrad Branch, Leningrad: 68–83.
- Doronin, I. V. [Доронин, И. В.] 2015. [The unknown life story of the eminent herpetologist]. *Studies in the History of Biology*. 7(1): 73–78.
- Doronin, I. V. [Доронин, И. В.] 2020. [New data on some Russian herpetologists. Communication 2]. *Current Studies in Herpetology*. 20(1/2): 65–76.
- Sukhova, N. G. [Сухова, Н. Г.] 2015. [Georgy Feodorovich Sukhov (1899–1942): A Biographical Essay]. *Studies in the History of Biology*. 7(1): 63–72.
- Terentyev, P. V. and Chernov, S. A. [Терентьев, П. В. и Чернов, С. А.] 1936. [Краткий определитель земноводных и пресмыкающихся СССР. Государственное учебно-педагогическое издательство, Москва–Ленинград, 96 с.] *Brief guide to amphibians and reptiles of the USSR*. State educational and pedagogical publishing house, Moscow-Leningrad, 96 p.
- Terentyev, P. V. and Chernov, S. A. [Терентьев, П. В. и Чернов, С. А.] 1936. [Стислий визначник земноводних і плазунів СРСР.

- «Радянська школа.» Київ–Харків, 96 с.] *Brief guide to amphibians and reptiles of the USSR*. “Soviet School,” Kyiv-Kharkiv, 96 p.
- Terentyev, P. V. and Chernov, S. A. [Терентьев, П. В. и Чернов, С. А.] 1940. [Краткий определитель пресмыкающихся и земноводных СССР. Второе переработанное и расширенное издание. ГУИП Наркомпроса РСФСР, Ленинград, 184 с.] *Brief guide to reptiles and amphibians of the USSR. Second revised and expanded edition*. GUIP Narkompros RSFSR, Leningrad, 184 p.
- Terentyev, P. V. and Chernov, S. A. [Терентьев, П. В. и Чернов, С. А.] 1949. [Определитель пресмыкающихся и земноводных. Третье дополненное издание. «Советская Наука» Москва, 340 с.] 1949. *Key to amphibians and reptiles. Third revised edition*. “Soviet Science,” Moscow, 340 p.
- Terent’ev P. V. and Chernov S. A. 1965. *Key to amphibians and reptiles (Opredelitel’ presmykayushchikhsya i zemnovodnykh)*. 3rd, enlarged edition. Approved by the Ministry of Higher Education of the USSR as a textbook for students of biology and pedology. Gosudarstvennoye Izdatel’sтво «Sovetskaya Nauka» Moskva 1949. Translated from Russian. Israel Program for Scientific Translations, Jerusalem, 315 p.
- Uetz, P., Cherikh, S., Shea, G., Ineich, I., Campbell, P. D., Doronin, I. V., Rosado, J., Wynn, A., Tighe, K., A., Mediarmaid, R., Lee, J. L., Köhler, G., Ellis, R., Doughty, P., Raxworthy, C. J., Scheinberg, L., Resetar, A., Sabaj, M., Schneider, G., Franzen, M., Glaw, F., Böhme, W., Schweiger, S., Gemel, R., Couper, P., Amey, A., Don-dorp, E., Ofer, G., Meiri, S., Wallach, V. 2019. A global catalog of primary reptile type specimens. *Zootaxa*. 4695(5): 438–450.

We suggest the following format for citing this article:

Ananjeva, N. B. and I. V. Doronin 2021. Herpetological century: 100th Anniversary of the Division of Herpetology, the Zoological Institute of the Russian Academy of Sciences, St. Petersburg. *Bibliotheca Herpetologica* 15(12):118–127.

The Tortoise in the Temple: Orientalism, Japonisme, and the Exploitation of Asian Turtle Mystique in Western Popular Imagination

Matthew P. Bettelheim

5500 Pennsylvania Blvd, Concord, California 94521 USA, blackfish@nasw.org

TO PUT ON A PEDESTAL

In the winter of 1916, the predominantly male readers of the Standard Oil Company of California's shareholder magazine, *Standard Oil Bulletin*, may have been surprised to find a somewhat unusual cover illustration and feature article in the December issue. Under the headline "Our Garden of Girls" with a cover to match, this issue was dedicated to the "Lunch Room... precincts set apart for the exclusive use of the women of the home-office force" on the roof of the Standard Oil Building in San Francisco, California. Flipping through this dated article replete with not-so-veiled allusions to the fairer sex ("the daisy and the rose," "the modest violet and the forget-me-not") in a sea of otherwise industry-standard briefs concerning asphaltum and crude oil prices, readers would have concluded their session with a glance at the back cover where an equally unusual advertisement for Zerolene Motor Oil awaited them.

There on the back cover stand three tortoises (Fig. 1). And stand they do—each upon a well lit square stone tablet raised above the ground on its own stone pillar. The room in which they are displayed is dark and brooding but otherwise nondescript, were it not for what appears to be a bonsai tree in a square pot. The pot, set upon a table off to one side almost like an afterthought, is inscribed with indistinct characters that appear at first glance to be Asian. The walls—faint but visible in the background—boast strong horizontal and vertical elements resembling the posts and beam timber lattice and paper paneling suggestive of traditional Asian architecture (Wichmann 2001). But any uncertainty regarding where this curious scene takes place is resolved in the accompanying ad copy for Zerolene Motor Oil which reads in part:

DEMONSTRATING LUBRICATION

IN A TEMPLE in Japan a number of tortoises placed on stone tablets go through walking movements without effecting change of location. The tablets have been greased and the slippery surfaces do not afford the friction-hold necessary to locomotion. Though this trick, first played on the tortoises centuries ago, thwarted travel instead of aiding it, it demonstrates the theory of lubrication—the elimination of friction.

Zerolene Motor Oil was the Standard Oil Company's motor oil brand, so named because it flowed freely at zero degrees (Standard Oil 1915). But the product being advertised isn't half as intriguing as the experience—the mystique—this advertisement was trying to monetize.

At least, that might be the case if there were any truth to this apocryphal tale of tortoises and temples, to which there's not. Because there were no such greased tortoises. And no such temple. The entire scene is a work of fiction, the fabrication of a good old-fashioned Madison Avenue ad-man.

THE AD-MAN COMETH

For 35 years, the *Standard Oil Bulletin* was published monthly by the Standard Oil Company of California (which later became Chevron in 1984) and distributed to its stockholders between 1913 and 1948. The periodical was published by the Standard Oil Company's ad agency, H.K. McCann Co. (later, McCann Erickson; today known as McCann), and contained articles about oil production, oil prices, services, and human interest stories on the West Coast (California, Oregon, and Washington). Each issue featured lavishly illustrated covers by West Coast artists who were breaking new ground in the "California Style" (Chevron Corp. 2007), such as (Lafayette) Maynard Dixon (1875–1946), Maurice George Logan (1886–1977), Harold Von Schmidt (1893–1982), Waldo Edmund Bemis (1891–1951), W. R. (Wesley Raymond) de Lappe (1887–1952), Carl Jacob Neher (1901–1970), and J. L. (Judson Lewis) Starr (1890–1960) (Hughes 1986).

The bulletin's cover art varied in subject matter, sometimes featuring their operations (e.g. oil fields), other times the breathtaking vistas of the West Coast. But no matter the vista, most of the covers managed to incorporate automobiles, ship liners, heavy equipment, or—at the very least—roadways, to keep in theme with the industry push to promote "the automobile's increased popularity and the mobile society that it created" (Chevron Corp. 2007). Predictably, many of *Standard Oil Bulletin* artists' work also graced the billboards that lined California's expanding roadway system at that time (Chevron Corp. 2007). On occasion, an unadulterated natural scene would slip in among the otherwise product placement-heavy magazine covers, such as the

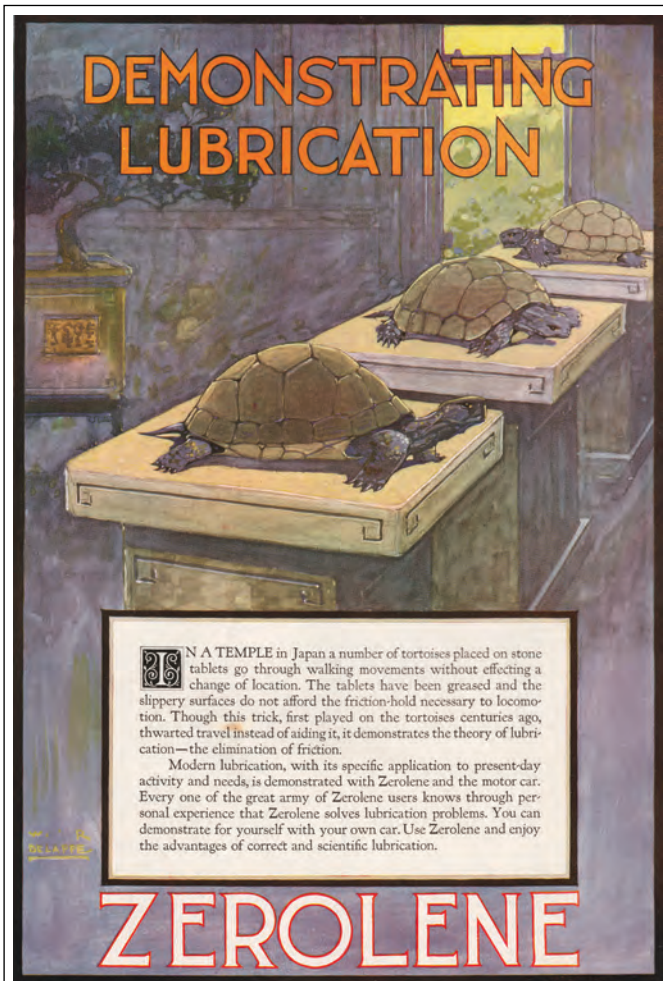


Fig. 1. The back cover of the December 1916 issue of the Standard Oil Company of California's shareholder magazine, *Standard Oil Bulletin*, featured this advertisement for Zerolene Motor Oil. The ad copy that accompanied this illustration describing tortoises placed atop greased pedestals in a Japanese temple appears to apocryphal, made up by an ad-man to monetize the mystique of Japan—a practice known today as *Japonisme*.

Desert Tortoise (*Gopherus* sp.) that adorned the April 1931 issue of *Standard Oil Bulletin* (Fig. 2). The editors and ad-men at Standard Oil Bulletin and McCann knew all too well that there was an "attention value" that came with depicting animals—like Zerolene's iconic polar bear (or tortoises)—in advertising (Standard Oil 1915).

H.K. McCann Co. founder Harrison King McCann himself commissioned the cover assignments from his "rich talent pool of illustrators":

With their unique convergence of social philosophies, artistic ideals, progressive attitudes and the ferment of the times, the artists were in the vanguard of what became known as the "California Style." Many narrowed traditional distinctions between fine and commercial art and managed to achieve recognition for both. Most of the illustrators represented one or more distinctive schools of art — such as Fauvism, "plein air"



Fig. 2. Although it was rare, wildlife were occasionally featured on the front cover of the *Standard Oil Bulletin*; the cover of the April 1931 issue, for example, featured a Desert Tortoise (*Gopherus* sp.) by famed American artist Maynard Dixon.

(literally, "open air" or *alfresco*) and Modernism—that gave an intellectual underpinning to their work (Chevron Corp. 2007).

W.R. de Lappe—the illustrator behind the Japanese tortoise Zerolene ad—was a fixture in McCann's stable of illustrators, working as a freelance artist under contract to McCann for approximately 50 years (Hughes 1986). The arts ran strong in de Lappe's social circle. After a brief marriage to de Lappe's then art student and future Hollywood screenwriter Marion Frances (born Marion Benson Owens), he later remarried and had a daughter, Phyllis "Pele" de Lappe, with his second wife Dorothy Sheldon. Pele would later befriend Frida Kahlo and Diego Rivera, join the Communist party, become a political cartoonist and rights activist and, eventually, an artist known for her social realism artwork (Hughes 1986, Beauchamp 1997, Scherr 2007).

Working for McCann, de Lappe's subjects varied. Sprinkled among de Lappe's numerous *Standard Oil Bulletin* covers are a front-to-back cover panorama of the California oil

Ad-Letter Contest Awards for April

As the contest goes on, the interest among SUNSET's readers in the advertising announcements shows a steady growth, and the judges had found it quite difficult to handle the flood of letters received this month. These letters come from all parts of the country and all reveal a real knowledge of advertising. The writers have found that this contest is more than fun—that it has an educational value that stimulates an appreciation of the great work the national advertisers and advertising writers are doing. Below are the prize winners for April, as the judges have decreed. They have made fair and impartial awards and if you have not written your letter as yet, these winners may give you some valuable suggestions.



First Prize—Zerolene

Curiosity, one of the most powerful and ever present instincts! Just to the degree that the advertiser plays upon it does he secure and hold the reader's attention. But the amount of curiosity in advertising takes place through the eye. What better than to offer to attract and mystery and newness to hold?

Three great tortoises, in sharp relief against a non-attention holding background, with the two words, clear cut and distinct above, "Demonstrating Lubrication." The reader's eye is instantly caught; his curiosity immediately aroused. He has seen the big word Zerolene at the foot of the page and probably knows what it is, but he does not pass on to another page and instantly dismiss Zerolene from his mind. His curiosity about the tortoises is still alive and if it nearly died at seeing the familiar word Zerolene it is instantly revived by the first thing he reads, "In a Temple in Japan." Here is mystery and newness again and he reads on, Zerolene still in his mind.

And now the relevancy of the curiosity incitor and the Zerolene must be shown, the point of the advertisement made and the whole thing done with while the interest is still alive. In the two short concise paragraphs of the advertisement all this is accomplished and in addition the word Zerolene is used by the reader four times just as he finishes reading. Zerolene is bound to be impressed indelibly upon his mind. It is truly a wonderful advertisement.

S. FORSYTHE BARKER.

1002 Hope Building, Seattle, Washington.



Second Prize—American Telephone

The American Telephone and Telegraph ad in April Sunset is an excellent example of the indirect or educational method in modern publicity work. The primary purpose of this ad is to reveal public opinion; its appeal is predicated on the broad, high ground of better living conditions for the nation's rural people; it seeks to spread the gospel of the telephone as an instrument of social and economic progress, to educate the farmer, to minimize the inconvenience and isolation of rural life by urging a more general use of the telephone. The black, wintry scene at the top of the ad focuses an accurate visualization of the "last-in" condition of farm life in the North during the long, idle winter months.

The accompanying text astutely suggests that the farmer with a telephone "need not starve from the cheerful hearth albatross in the winter, nor give along dark roads for friendly news or aid in time of trouble. The telephone is 'the farmer's key to the outside world.'" The conclusion is plain—that the telephone, as a civilizing influence, had done and is doing more to alleviate the national isolation of rural life than any other agency, not even accepting the rural free mail delivery. Throughout, the ad is broadly educational in its tone. Somewhat incidentally we are told that the Bell System is serving 2,250,000 farmers; it extends throughout the length and breadth of the land; it has "One Policy—One System—Universal Service." This is advertising in the highest form.

MARY KROCK.

6718 Elm Ave., Chicago, Ill.



Third Prize—Grape Nuts

"Food Fit for a King!" means Grape Nuts prominent among the breakfast foods and the beautiful and delicate blending of colors makes the ad pleasant to look at and appealing to the appetite in its rich, luscious tones.

The glow of health, the expression of content on the faces of the young, crowned "Ambassadors of the Breakfast Table" as well as of the mother are convincing to the skeptic that Grape Nuts are healthful as well as palatable.

Cheers and Praise! Ye gods! and Grape Nuts, too! Not only "Food that's fit for a king" but it's good enough for plain domestic Americans with never a hankering for kingly food!

Conversations mark the ad, too, since it says just enough and tells its story clearly, succinctly, convincingly and the yellow box is the second wish "True" understood.

The picture on the wall blends past and present, harking back to colonial days—just a step down from kings; the shining, merry, happy faces and health; the greenery in the window and the dairy produce harmonize with the fruits on the table and the winsome brightness of the happy faces make Grape Nuts the index of the story.

Good business acumen and an aesthetic temperament have made this ad a twelve cylinder success; it's a success.

BENJAMIN MONROE JOURNAL.

Boston, Texas.

AWARDS OF MERIT—In addition to the particularly good prize winning letters reproduced above, the letter of C. M. Voshagen, Warren, New York, on the advertisement of the Baur & Black "Blue Jay Corn Plaster," and the letter of Mrs. Guy Bancroft, East Chatham, Vermont, on the advertisement of Edward V. Hartwood, Inc., Shastak, Alaska have been found worthy of special mention and a cash award of five dollars each. Many other extremely good letters were received, analyzing the advertisements of Eastman Kodak, Indian Motorcycles, the Victor Talking Machine Co., the Postal Life Insurance Co., Glenwood Range, Ingersoll, Johnsons Candies, Schilling's Auto Camp, and a number of others, but it was impossible to make the five prize take care of them all.

FIVE CASH PRIZES EACH MONTH FOR MERELY WRITING LETTERS

The object of this Contest is to stimulate the interest of Sunset Magazine readers in the advertising announcements of the national advertisers whose advertisements appear each month in the Magazine, and to encourage a keener appreciation of the value of design and text.

This constitutes a good advertisement! Why do some ads appeal more strongly to you than do others? Why did this or that announcement indelibly impress itself upon your memory?

Study the ads in this number of Sunset. Try to analyze the advertisements that made the deepest impression upon your mind. Then write down your reasons. Simple, isn't it? Now! For the best letter received each month we will award a cash prize of \$25.00; for the second best letter, a prize of \$15.00; for the third, a prize of \$10.00. Each of these letters will be published in Sunset Magazine, together with a reproduction of the ad, and the names and addresses of the prize-winning letter writers. In addition to

these awards, there will be two \$5.00 cash prizes as awards of merit for the fourth and fifth best letters.

Above are the prize-winning letters in the April Contest. They are good letters, carefully written and carefully analyzing strong ads. There were hundreds of other letters but these were selected by the judges as the best of all submitted in April. Study them as models for your letter.

Every reader of Sunset is entitled to enter the contest.

RULES GOVERNING THE AD-LETTER CONTEST

The contest begins with the January, 1917, issue and will run until July, 1917.

The letter must not exceed 250 words in length.

The letter must state the name and address of the writer and in no instance will we assume responsibility for the return of manuscripts.

The letter must be submitted within ten days after

receipt of copy by the subscriber in order to reach us in time for consideration. The announcement of the prize will follow in the second month's number of Sunset—for example, the prize-winning letters submitted on the advertisements in the June Sunset must reach us not later than June 10th and the awards will be announced in the August issue of Sunset.

If you can write a letter, you stand a chance to obtain one of these cash prizes.

The conditions of the Contest are all set forth in the announcement. It will not be necessary to write for further particulars. Just send in your letters, typewritten if possible, together with your name and address.

Send Your Subscription and Address all Correspondence to Contest Editor, Sunset Magazine, San Francisco

Fig. 3. Several months after the Japanese tortoise Zerolene ad ran in the December 1916 issue of *Standard Oil Bulletin*, it appeared in the April 1917 issue of *Sunset: the Pacific Monthly* magazine. Later that June, *Sunset* editors announced the ad as the first-place winner of the magazine's monthly "Ad-Letter Contest".

fields (August 1923), a bituminous asphalt distributor truck set against the backdrop of Half Dome in Yosemite National Park (July 1929), and an ominous representation of California's Saber-toothed Cat (*Smilodon californicus*) against a starry night sky (January 1930). And in addition to cover art, de Lappe also provided illustrations for commercial advertisements, including the Japanese tortoise Zerolene ad.

Several months after appearing in the December 1916 issue of *Standard Oil Bulletin*, the Japanese tortoise Zerolene ad ran in the April 1917 issue of *Sunset: the Pacific Monthly* magazine (page 82) (Sunset 1917a). Later that June, *Sunset* editors announced this very same advertisement the first place

winner of the magazine's monthly "Ad-Letter Contest" (Sunset 1917b) (Fig. 3). The contest, based on write-in submissions from *Sunset*'s readers, was inspired "to stimulate the interest of *SUNSET* Magazine readers in the splendid announcements of the national advertisers whose advertisements appear each month in the Magazine, and to encourage a keener appreciation of the values of design and text" (Sunset 1917b). The first prize winning letter, which garnered reader Mr. S. Forsythe Barker of Seattle, Washington a \$25 cash prize, reads:

Curiosity; one of the most powerful and ever present instincts! Just to the degree that the advertiser plays upon it does he secure and hold the reader's attention. But the arousal of curiosity in advertising takes place through the eye. What better than color to attract and mystery and newness to hold?

Three great tortoises, in sharp relief against a non-attention holding background, with the two words, clear cut and distinct above, "Demonstrating Lubrication." The reader's eye is instantly caught; his curiosity immediately aroused. He has seen the big word Zerolene at the foot of the page and probably knows what it is, but he does not pass on to another page and instantly dismiss Zerolene from his mind. His curiosity about the tortoises is still alive and if it nearly died at seeing the familiar word Zerolene it is instantly revived by the first thing he reads, "In a Temple in Japan." Here is mystery and newness again and he reads on, Zerolene still in his mind.

And now the relevancy of the curiosity incitor [sic] and the Zerolene must be shown, the point of the advertisement made and the whole thing done with while the interest is still alive. In the two short concise paragraphs of the advertisement all this is accomplished

and in addition the word Zerolene is used by the reader four times just as he finishes reading. Zerolene is bound to be impressed indelibly upon his mind. It is truly a wonderful advertisement (Sunset 1917b).

At the risk of putting stock in the analytical skills of an inexpert, Barker picked up on a visceral level the aura of mystery and exoticism that McCann likely commissioned de Lappe to convey through this at-first obtuse imagery and the accompanying ad copy. After setting the hook with three tortoises front and center, the text launches headfirst into Japan and temples, causing our focus to dart between the two,



Fig. 4. The mythological *minogame* is characterized by the depiction of a hairy “straw rain-coat” tail of seaweed and algae. Courtesy the National Archives of Japan Digital Archive CC0 (CC0 1.0 Worldwide Public Domain Offering).

picking up along the way the subtle breadcrumbs the bonsai tree, Japanese text, and the architecture represent to create a sense of place. Immersed now in the foreign otherness of a far-off land, the tale that follows connects the dots between these tortoises’ never-ending journey and the miracle that is Zerolene Motor Oil.

A CLOSER LOOK

Based on a review of available paper and digital English language Japanese mythology resources (e.g. www.hathitrust.org, www.archive.org, www.biodiversitylibrary.org, chroniclingamerica.loc.gov, and cdnc.ucr.edu) (presumably, this would amount to a representative sampling of the same English-language books, newspapers, magazines, and journals that would have been available to and possibly influenced de Lappe), consultation with Japanese herpetologists, and consultation with western herpetologists with experience in Japan (for a list of experts consulted, see the Acknowledgements), there appears to be no credible recorded evidence to support the authenticity of the tale embodied in this advertisement. To the best of anyone’s knowledge, the scene acted out in the Japanese tortoise Zerolene ad simply never happened.

Because Japanese mythology and religion (i.e. Buddhism) in particular have become amalgams of local and external traditions, including many originating in China (Joly 1908, Ashkenazi 2003), it helps to cast a broad net in the hope of finding the roots of this tale. Notwithstanding the why of it all—why would Japanese monks set tortoises upon a Sisyph-



Fig. 5. The Edo period color woodblock print *Urashima Tarō Returning on the Turtle (Kikoku Urashima)* (1882) by Tsukioka Yoshitoshi (1839–1892), vividly illustrates the mythological *minogame*’s hairy “straw rain-coat” tail of seaweed and algae. Courtesy the Los Angeles County Museum of Art.

ean task (this question goes unanswered!)—this tale entirely ignores the contradictorily exalted role turtles and tortoises (the two terms are used interchangeably in the anthropological literature) play in Asian mythology.

In Japan, the turtle, or *kame* (or *game*, when a noun precedes the word *kame*; e.g., *umigame* = sea turtle, *hakogame* = box turtle, *midorigame* = green turtle), is known for its longevity and wisdom (Joly 1908, Allen 1917, Ball 1920b). One variation of the tortoise, the mythological *minogame* (which translates to “rain-coat tortoise” for its resemblance to a straw rain-coat) (Fig. 4) is described and depicted with a hairy tail of seaweed and algae acquired after ten thousand years (Joly 1908, Allen 1917, Ball 1920b). One such *minogame* makes an appearance in the legend of Urashima Tarō (Fig. 5), in which a fisherman is rewarded for saving a turtle (Joly 1908, Seki 1966, Ashkenazi 2003). Another Japanese myth, adopted from China, tells of four Guardian Beasts that protect the city of Heian (present-day Kyoto) from threats; one of those celestial guardians is *Gen-bu*, known also as the Black Tortoise or Dark Warrior of the North, depicted as part-snake, part-tortoise (Ball 1920a, Ball 1920b, IDP 2020).

Even if only by accident, the very act of placing tortoises atop pedestals in a temple might also evoke a comparison to statues. Chinese records, for example, indicate that “pious Buddhists ‘carried close to their bodies a tortoise charm thereby to acquire honors’” exemplified by small jade tortoises known as *Ch’ien-Kuei* or “cash-coin-tortoises” (Fig. 6) (Nott 1946). While not strictly statues on the scale usually imagined, these miniatures do represent an example of tortoises cast in stone. On a larger scale, in China, the mythological Dragon king *Bixi*, often depicted as a dragon with the shell of a turtle, continues to be a common fixture in statues—specifically, as the plinth or pedestal of memorial stelae and tablets (Ball 1920a) (Fig. 7). While such sculptures are

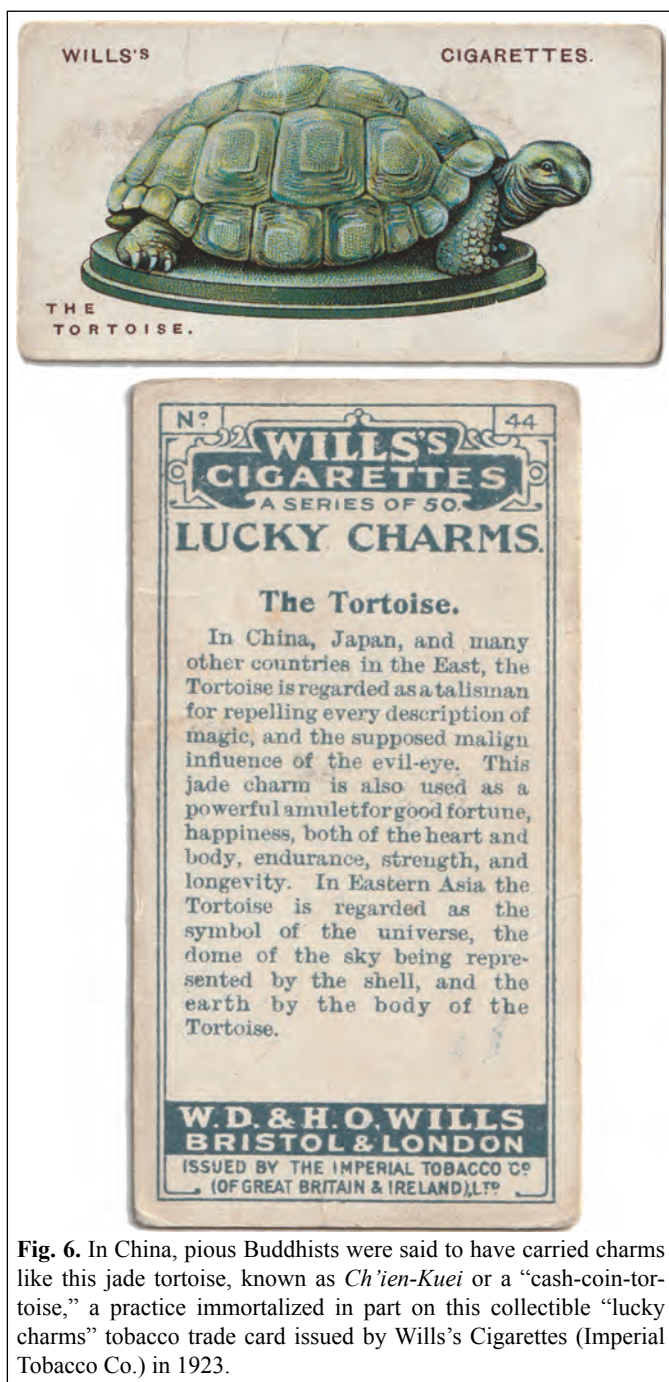


Fig. 6. In China, pious Buddhists were said to have carried charms like this jade tortoise, known as *Ch'ien-Kuei* or a “cash-coin-tortoise,” a practice immortalized in part on this collectible “lucky charms” tobacco trade card issued by Wills’s Cigarettes (Imperial Tobacco Co.) in 1923.

common throughout China, they appear to be less abundant in Japan. No matter where they appear, however, the *bixi* or *kame* almost always appear at the base and rarely appear atop the pedestal.

Ball (1920b), however, mentions an exception. The Enoshima Shrine (aka Enoshima Benten), a Shinto shrine on Enoshima Island, Fujisawa, Kanagawa (prefecture), features a *kame-ishi*, or “turtle stone,” that is patterned like a turtle’s shell (Figs. 8 and 9) and might be what Ball described as a “large monument, consisting of a stone tortoise mounted on a pedestal” that “embellished” the garden. In describing



Fig. 7. In China, the mythological Dragon king *Bixi* frequently appears in memorial stelae and tablets as the plinth or pedestal. Such statues, like the one illustrated in this vintage hotel travel label for The Bridge House Hotel Limited in Nanking (=Nanjing), China, are relatively common throughout China.

his travels through Japan between 1890 and 1893, American expat Patrick Lafcadio Hearn (1894) described encountering this monument: “Near by is a singular stone, set on a pedestal in the court. It has the form of the body of a tortoise, and markings like those of the creature’s shell; and it is held a sacred thing, and is called the Tortoise-stone.” Also at the Enoshima Shrine is a *kame* painted by Hoitsu Sakai in 1803, inset into a recess of the caisson ceiling—the “*Happo-nirami no Kame*” (the turtle glaring at all sides [eight directions]) (aka the Happo Gaze turtle), whose Mona Lisa-like gaze follows the viewer (Hearn 1894, Ball 1920b) (Fig. 10).

Curiously enough, another possible explanation can be found through a closer examination of a practice immortalized in the well-known Edo period (1857) woodcut print *Mannen Bridge, Fukagawa* (*Fukagawa Mannenbashi*) No. 56 (Fig. 11), by Utagawa (Andō) Hiroshige, one in a series of 119 ukiyo-e landscape prints from the popular *One Hundred Famous Views of Edo* (*Meisho Edo Hyakkei*). In this iconic print, a turtle hangs suspended from a string tied around its middle, a common display tactic by vendors in the city of Edo’s (present-day Tokyo) Fukagawa district where turtles and fish were bred, to be sold later near waterways so that the buyers could release them nearby and obtain karma. But to the west in the city of Osaka, vendors instead displayed



Fig. 8. The Enoshima Shrine (aka Enoshima Benten) on Enoshima Island, Fujisawa, Kanagawa (prefecture) also features a *kame-ishi*, or “turtle stone,” patterned like a turtle’s shell. Courtesy of Daderot.

their turtles atop an upright culm, or stalk, of cut bamboo, placed in such a way that the turtle was denied locomotion (Fig. 12) (Gincho 1835)—or, to borrow a phrase from a Japanese tortoise Zeroline ad, “thwarted travel.” A western variation on this theme can be seen in the 1877 illustrated plate *In the Larder* (Fig. 13), which depicts two Diamondback Terrapins (*Malaclemys terrapin*)—one balanced immobile right-side-up atop the foot of an upside-down wine glass, the other equally immobilized upside-down, another example of thwarted travel (Laffan 1877).

Historically, seven turtle species are native to the island country of Japan: the Ryukyu Black-breasted Leaf Turtle (aka *ryukyu yamagame*) (*Geoemyda japonica*), the Japanese Pond Turtle (aka *nihon ishi game*) (*Mauremys japonica*), the



Fig. 9. A close-up detail of the Enoshima Shrine’s *kame-ishi*, or “turtle stone,” patterned like a turtle’s shell on Enoshima Island, Fujisawa, Kanagawa (prefecture) (Courtesy of Natasha Murashev, NatashaTheNomad.com).



Fig. 10. The ceiling of the Enoshima Shrine (aka Enoshima Benten), a Shinto shrine on Enoshima Island, Fujisawa, Kanagawa (prefecture), features a painting by Hoitsu Sakai (1803) of a kame (turtle)—the “*Happo-nirami no Kame*” (the turtle glaring at all sides [eight directions]) (aka the Happo Gaze turtle). Like the Mona Lisa, the turtle’s eyes are said to follow the viewer as they move through the shrine (Courtesy of Natasha Murashev, NatashaTheNomad.com).

Ryukyu Yellow Pond Turtle (aka *yaeyama ishigame*) (*Mauremys mutica kami*), the Yellow Pond Turtle (aka *minami ishigame*) (*Mauremys mutica mutica*), the Reeves’ Turtle (aka *kusagame*) (*Mauremys reevesii*) (possibly introduced), the Chinese Box Turtle (aka *yaeyama semaru hakogame*) (*Cuora flavomarginata*), and the Chinese Softshell Turtle (aka *nihon suppon*) (*Pelodiscus sinensis*) (Lovich and Yamamoto 2016; Turtle Taxonomy Working Group 2017).

Assuming for a moment that de Lappe carefully researched—or, less likely, had first-hand experience with—Japanese turtles beforehand, these species can be largely ruled out by comparing them, even if only superficially, with



Fig. 11. The Edo period woodcut print *Mannen Bridge, Fukagawa* (*Fukagawa Mannenbashi*) No. 56 (1857), by Utagawa (Andō) Hiroshige (1797–1858), is one of a series of 119 ukiyo-e landscape prints from the popular *One Hundred Famous Views of Edo* (*Meisho Edo Hyakkei*). The bridge's name—"Mannen"—translates to "ten thousand years," which may have been a visual/verbal reference to the turtle as a symbol of longevity. The Fukagawa district was also a common place where turtles and fish were bred, to be sold later near waterways so that the buyers could release them nearby and obtain karma.

the "tortoise" depicted in the advertisement. For example, de Lappe's mystery tortoises lack the well-marked longitudinal keels and serrated posterior marginal scutes characteristic of the Ryukyu Black-breasted Leaf Turtle (Yasukawa and Ota 2008), the low medial keel and serrated posterior marginal scutes characteristic of the Japanese Pond Turtle (Yasukawa et al. 2008), the longitudinal medial keel characteristic of the Ryukyu Yellow Pond Turtle and Yellow Pond Turtle (Yasukawa et al. 1996), the three longitudinal keels and yellowish stripes along the head and neck characteristic of the Reeves' Turtle (Lovich et al 2011), the distinct medial keel characteristic of the Chinese Box Turtle (Ota et al 2009), and the soft shell characteristic of the Chinese Softshell Turtle.

Morphometrics aside, however, one could reason that de Lappe may have overlooked the prominence of the omni-



Fig. 12. Hiratei Gincho's 1835 article in *Word Around Town* [街能噂] describes the two ways vendors displayed turtles. Roughly translated, the illustration explains that in the city of Osaka, vendors displayed the turtles on top of a bamboo stem ("Turtles to be released in Osaka") and "Bamboo pipes are cut and the turtles are placed on top as shown in the diagram") while in the city of Edo, vendors hung the turtles with thread tied around their middles ("Turtles to be released in Edo") and "Their torsos are tied with a string and hung as shown in the diagram—all are sold on bridges"). Turtles sold in the Osaka style would have been immobilized atop the bamboo stems.

present keel characteristic of Japan's turtle's shells, or that de Lappe had instead approached the assignment as more of a cartoonish likeness or loose interpretation rather than a technically accurate scientific illustration (an argument bolstered by his approach to the purported Japanese text, described below). If so, there could be a case made for the Chinese Box Turtle based loosely on its prominently domed carapace, large head, and the drab, dark brown ground color of the carapace (notwithstanding the reddish brown spot typically found on each carapace scute and the pale line that delineates the medial keel) (Ota et al 2009).

In 1916, the closest thing to an English-language field guide to Japan's reptiles and amphibians was Leonhard Stejneger's 1907 *Herpetology of Japan and Adjacent Territory*, which was made available not as a traditional field guide



IN THE LARDER.

Fig. 13. The illustrated plate *In the Larder*, prepared for the article “Canvas-Back and Terrapin” as part of a feature article in an 1877 issue of *Scribner’s Monthly*, depicts the finer things in life: oysters, canvas-back ducks, a box of Flor Fina cigars, a case of Bordeaux wine from the Château Pontet-Canet. Among these luxuries are two Diamondback Terrapins (*Malaclemys terrapin*)—one balanced atop the foot of a wine glass, the other upside-down. Both are equally immobilized, not unlike the tortoises in the Japanese tortoise Zeroline advertisement.

(field guides were still in their infancy) but as a scientific bulletin published by the Smithsonian Institution. Therein, Stejneger’s monochromatic plate (Plate XXXIII) (Fig. 14) featured both a dorsal and lateral view which conveniently obscured distinctive characteristics like keels or chromatic markings (Stejneger 1907). Stejneger’s plate was adapted from a similarly monochromatic plate (Plate V) in Günther’s 1864 *The Reptiles of British India* (Günther 1864) that featured similar views. Although these resources existed, and their illustrations would have made the omission of the diagnostic keel forgivable, from what we know about the tall tale upon which de Lappe designed this advertisement, it is probably safe to assume that he did not have a particular Japanese turtle species in mind.

Likewise, the purported Japanese text inscribed on the bonsai tree’s square pot is as indistinct as de Lappe’s tortoise. A close inspection of these characters reveals them to be a weak simulacrum of traditional Japanese kanji, hiragana, or katakana scripts. Instead, the faux script might be better described as an early example of stereotypical “ethnic type” known today as “chop suey,” “chopstick,” or “stirfry” lettering that culturally appropriate brushstrokes and cuneiform suggestive of Asian script (Print 2009). Because there’s no

expectation the average reader of *Standard Oil Bulletin* could read Japanese script, this trick would not have been all that different (stereotypes aside) from the Western type-setter’s *Lorem ipsum* dummy text meant to fill space, an ad-man’s gimmick to monetize the exoticism of this tall tale.

If anything, the paper-thin “mythology” of the Japanese tortoise Zerolene ad bears a closer resemblance to the contemporary “post turtle” joke-cum-phrase common in North America when describing politicians. As one version of the joke goes, following a discussion of past American President George W. Bush’s health-care-reform ideas, one gentleman remarks, “Well, ya know, old Bush is a post turtle.” When asked what a “post turtle” is, he answers, “When you’re driving down a country road, and you come across a fence post with a turtle balanced on top, that’s a post turtle. You know he didn’t get there by himself, he doesn’t belong there, he can’t get anything done while he’s up there, and you just want to help the poor thing down” (Blank 2009). Over time, abbreviated versions of this joke have embraced a more concise wisdom: “Anytime you see a turtle up on top of a fence post, you know it had some help.” While it is unknown when the joke originated, the phrase has been traced as far back as a 1978 sermon by The Church of Jesus Christ of Latter-day

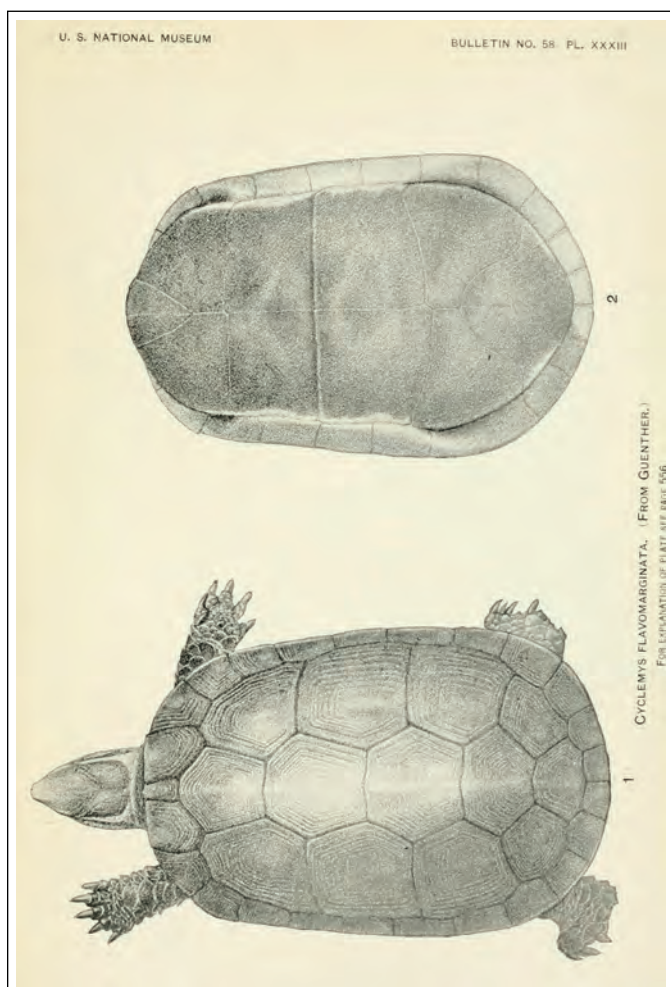


Fig. 14. Among the six turtle species native to Japan, one species most closely resembles the tortoises featured in the Zerolene Japanese tortoise ad: the Chinese Box Turtle. In 1916, the best English-language resource for one looking to learn more about Japan's reptiles and amphibians was Leonhard Stejneger's 1907 *Herpetology of Japan and Adjacent Territory* published in the form of a scientific Smithsonian Institution bulletin. Included in Stejneger's guide was this monochromatic plate (Plate XXXIII) illustrating the Chinese Box Turtle.

Saints general authority Ronald E. Poelman (Poelman 1978), and in print in Mary Doria Russell's novel *The Sparrow* (Russell 1996).

Assuming the resemblance between the Japanese tortoise Zerolene ad and a "post turtle" is purely coincidental (the ad appears to predate the joke, and the reference is incongruous at best), it is worth re-examining inexpert reader Barker's suggestion that the Madison Avenue ad-men were indeed cultivating "curiosity... mystery and newness" (Sunset 1917b) to sell a can of motor oil.

"THE ORIENT" AND "THE OCCIDENT"

Given that de Lappe's Japanese tortoise Zerolene ad draws heavily from Japanese imagery, it is worth examining the



Fig. 15. The intersection of Orientalism and advertising was evident in the tobacco industry, which marketed cigarettes hand-rolled from Turkish tobacco leaf under exotic brand names such as Murad. Produced by the New York-based Greek tobacconist Soterios Anargyros, Murad advertisements capitalized on the exoticism of Orientalist imagery to increase sales, such as this fantastical 1923 ad featuring a fashionable woman in flapper-styled attire riding atop a giant turtle, guiding it with a bull-whip and reins.

history of Orientalism and Japonisme in Victorian America. "Orientalism" is a concept first established by cultural critic Edward W. Said in his 1978 book *Orientalism* meant to describe the West's (aka, the "Occident;" Europe and America) historically contemptuous representation of the East (aka the "Orient;" Asia, North Africa, and the Middle East). In Said's own words, "Orientalism [was] a Western style for dominating, restructuring, and having authority over the Orient" (Said 1978). At its root, Orientalism embodied underpinnings of superiority over, and a Eurocentric prejudice against, the East when held against the mirror of the West. The clichés employed were inaccurate at best, and were based on cultural representations that emphasized and exaggerated a sense of difference, the exotic, or otherworldliness (Said 1978).

Long before Said defined Orientalism, however, academics understood the caustic relationship that had developed between the West and the East, as exemplified by Basil Hall

Chamberlain, emeritus professor of Japanese and Philology at the Imperial University of Tokyo, in the introduction to his book, *Things Japanese*:

Europe's illusions about the Far East are truly crude. Who would dream of coupling together New-Englanders and Patagonians, simply because arbitrary custom has affixed the single name "America" to the two widely separated regions which these two peoples inhabit? Yet persons not otherwise undiscerning continue to class, not only the Chinese, but even the Japanese, with Arabs and Persians, on the ground that all are equally "Orientals," "Asiatics," though they dwell thousands of miles apart in space, and tens of thousands of miles apart in culture... (Chamberlain 1905).

Because of Europe's—especially France and Britain's—geographic adjacency and long history of colonialism in the "Far East" (China and Japan), the concept of Orientalism first arose in Europe in the late 18th century (Said 1978), but didn't firmly take root in America until after World War II with the transformative urbanization and industrialization of the country (Rosenblatt 2009). That is not to say, however, that the seeds of Orientalism had not already been sown in American soil.

Unlike their European forebearers, early American Orientalism didn't limit itself to the Far East. For example, one way it manifested itself anew was through the exploitation of the "Middle East" (imprecisely, southwest Asia, Turkey, Egypt, the Arabian Peninsula; a geography that overlaps at times with the "Near East") by tapping into a distinct aesthetic built on a material culture redolent of luxury, sensuality, and debauchery mixed contradictorily with uncivilized barbarism. Although this approach was slightly off-brand from the traditional nuances of European superiority and prejudice, it ended with similar results: cultural domestication (Rosenblatt 2009).

As early as 1893, the Columbian World Exposition in Chicago boasted an Ottoman Pavilion that featured Bedouins, belly dancers, and camels (Rosenblatt 2009). In America, Orientalism became especially evident in the consumer culture of the Victorian era (1837–1901) during the 19th century. It was then that "the 'Orient'" became synonymous with romance, mystery, and barbarism" to the extent that "American capitalists exploited and encouraged popular assumptions about the Orient as a means of encouraging impulsive consumer spending, which served as a precursor to modern marketing methods" (Rosenblatt 2009).

Higashi (1994) describes this Victorian retail strategy as follows:

During the second half of the nineteenth century, Americans expressed a fascination with travel in their enthusiasm for museum and world's fair exhibits, postal cards, magic lantern slides, stereographs, panoramas and dioramas... and so forth. As realist representation of the urban scene demonstrated, touring exotic

territory was equivalent to voyeurism rationalized in pedagogical terms... As significant aspects of genteel middle-class culture, the degree of self-control required in the performance of social rituals and the desire to travel to strange, alluring places were surely not unrelated. Orientalism, in other words, was a sign not only of psychic repression but of chronic frustration resulting from the inability to interpret the meaning of coded forms of social intercourse... the mysteriousness of impenetrable social observances was projected onto the enigmatic terrain of the "Other."

In other words, Orientalism gave Americans a socially acceptable way to use consumption as a form of self-gratification (Higashi 1994) or, seen from the perspective of the department store, "to trigger buying on impulse, aiming for the emotions rather than rational thought and calculation" (McAlister 2005). In the late 1890s, as the mass production of consumer goods appeared likely to outpace consumer demand in America, marketing/advertising blossomed to meet the growing challenges of materialism in a new arena: the department store and, by extension, the mail-order catalogue (Rosenblatt 2009).

At its height, the Orientalism that had first found a footing in museum exhibits and travel exposés soon became commonplace in the consumer culture of Victorian America. "An Orientalist aesthetic highlighted the mystery and alluring sensuality of the Orient, through the use of deep, warm colors, exotic patterns, and depictions of oases, harems, mosques, and bazaars" (Rosenblatt 2009).

Nowhere was this more apparent than the advertising campaigns behind cigarettes. With brand names like Mecca, Medina, Murad, Omar, Fatima, and Camel, pre-mechanization cigarettes were hand-rolled from Turkish tobacco leaf. The fledgling tobacco industry marketed their products under the banners of sophistication, luxury, and lavish indulgence (Stanford University 2007, Rosenblatt 2009) featuring women "seen as less of a reflection on Victorian femininity than a fantasy of an exotic enchantress from a foreign land or a modern woman shedding the shackles of Victorian propriety" (Stanford University 2007) (Fig. 15).

European and American interpretations and imitations of the Far East's artistic traditions took many forms. While Orientalism was at heart exploitative, in the 19th century a more affirmative imitation arose in the arts known as Chinoiserie and Japonisme (also, Japonism). The popularity and influence of these movements instead celebrated Chinese and Japanese art and design. These influences can still be seen today in western European visual arts (the works of Vincent van Gogh), performing arts (Gilbert & Sullivan's *The Mikado*), landscaping (Claude Monet Giverny garden), architecture, and clothing (McAdams 2016).

Japonisme arose in post-1854 Europe and America as Japan began to open itself to foreign trade. For more than 200 years, Japan had closed itself off from the world through an isolationist policy they called *sakoku*, the "secluded country,"

but all of that changed when the so-called “bamboo curtain” came down facilitating a surge in trade and travel (Lam-bourne 2005). Named by art critic Philippe Burty in 1872, Japonisme embodied a broad appreciation for Japan and its culture (Gliem 2008) from fashionable to simple fascination (Sosnowski 2017). Artists inspired by the Japanese arts became known as Japonistes, and practiced a more reflective expression of imitation that copied Japanese processes, papers, and aesthetics. Japonisme reached its peak in the 1890s, but it continued to influence Western artists up into the late 1910s. Nevertheless, even as some continued to immortalize Japan’s pre-commercialized society, the Japanese aesthetic found its way into Western commerce and advertising (Capua 2015) and shone brightly through not only the manufacture, but also the sale, of merchandise that included examples of both fine art as well as replicas (McAdams 2016).

While Japonisme was in many ways a facet of Orientalism—both, for example, were imitative—Japonisme distinguished itself through Japan’s resistance to overt colonialism or domination. The Japanese did not seem to suffer from cultural domestication as other countries did under Orientalism (Alric 2008). Instead, through Japonisme, there was a more equal, consensual exchange of culture in either direction: Japanese arts were westernized just as European and American arts blossomed under the influence of Japan (Kober 2014).

A WORLD OF PURE IMAGINATION

And so it was that de Lappe’s Japanese tortoise Zerolene ad must have found its influence—riding the coattails of equal parts Victorian era consumer culture, Orientalism, and Japonisme to sell, of all things, motor oil through the mystery and allure of a fictitious Japanese temple and three tireless tortoises acting out a never-ending story.

Where along the spectrum described above does the ad fall? Is it imitative in a reflective, affirmative mode in the spirit of Japonisme? Is it reductive or exploitative in the shadows of Orientalism? The answer likely lies somewhere in between. By the very nature of the imagery appearing in an advertisement for motor oil, the ad itself is exploitative—the West commercializing the East by monetizing imagery purportedly portraying a centuries-old practice that hints at mysticism and ritual.

On the other hand, although the ritual is baseless, its inherent aimlessness—the vagaries of the Who? (*Who places the tortoises on the pedestals?*) and the Why? (*Why mustn’t the tortoises make any progress?*) and the What? (*What is the significance of this ritual?*) of it all, even if it is entirely made up—leave so much to the imagination that any thought put into finding a higher purpose behind it becomes ruminative at best. In fact, the very act of fabricating a ritual without purpose that involves a journey with no destination becomes its own self-fulfilling wish fulfillment. The viewer becomes the tortoise, stymied from ever achieving enlightenment. In a spiritual sense, then, the ad is in a way reflective, albeit inadvertently so.

Although the tale continues to capture the imagination even today, that’s where this tale’s story begins and ends—in one’s imagination. Three tortoises immortalized forever in one ad-man’s mind’s eye, raised on pedestals and lionized like statues, and entombed on the dusty back pages of forgotten periodicals. An ignoble finale for three imagined tortoises with no more agency than the ad-agency’s ink that gave them life, trapped on the page as much as they are trapped atop their pedestals.

ACKNOWLEDGEMENTS

This work could not have been undertaken without the help of Hidetoshi Ota, Maiko Ikeda, Tsutomu Hikida, Katsuya Yamamoto, Erika Yamasaki, Noriko Oshima, Monk Yun Rou, and Lance Smith for their assistance researching the provenance and authenticity of de Lappe’s Japanese tortoise tale and imagery; Irene Kelly, Rachel Sprague, Peter Paul van Dijk, Anders Rhodin, Robert Hansen, Jeffrey E. Lovich, Carlos Alvarado Laguna, and Breck Bartholomew for their assistance putting me in contact with the above herpetologists; and Stewart Alter and Patricia Johnson for providing background on McCann and W. R. de Lappe. A special thanks in particular to George H. Balazs (www.georgehbalazs.com) who was instrumental as a liaison between me and native Japanese, Chinese, and Korean scholars during the research phase, and Sarah Anne Bettelheim and Noriko Oshima for reviewing drafts of this manuscript.

REFERENCES

- Allen, Maude Rex. 1917. *Japanese Art Motives*. A.C. McClurg & Co., Chicago: 341 p.
- Alric, Claude. 2008. Un aller retour pour Cipango. Essai sur les paradoxes du japonisme de Denise Brahimi. *Sociétés & Représentations* 2(26):247–253.
- Ashkenazi, Michael. 2003. *Handbook of Japanese Mythology*. ABC-CLIO, Santa Barbara, California: 375 p.
- Ball, Katherine M. 1920a. Decorative Motives of the Oriental Art—Second Series, Part XX. *Japan: an Illustrated Magazine of Oriental Travel* 10(1):21–26.
- Ball, Katherine M. 1920b. Decorative Motives of the Oriental Art—Second Series, Part XXI. *Japan: an Illustrated Magazine of Oriental Travel* 10(2):23–28.
- Beauchamp, Cari. 1997. *Without Lying Down: Frances Marion and the Powerful Women of Early Hollywood*. University of California Press, Berkeley, California. 475 p.
- Blank, Trevor J. 2009. *Folklore and the Internet: Vernacular Expression in a Digital World*. Utah State University Press, Logan, Utah. 260 p.
- Capua, Rebecca. 2015. Japonisme and Japanese works on paper: Cross-cultural influences and hybrid materials’ in *Adapt & Evolve 2015: East Asian Materials and Techniques in Western Conservation. Proceedings from the International Conference of the Icon Book & Paper Group, London 8–10 April 2015* (London, The Institute of Conservation: 2017), 28–42.

- Chamberlain, Basil Hall. 1905. *Things Japanese: being notes on various subjects connected with Japan for the use of travellers and others*. John Murray, London. 552 p.
- Chevron Corp. 2007. "The Art of Communication: Looking Back at the Paintings that Helped a Line Rider Predecessor Cover the Big Stories." *Line Rider* (December):8.
- Gincho, Hiratei [平亭銀 鷗 作] 歌川貞広 画]. 1835 [天保 6]. Word Around Town [街能囃]. *Tasuke Kawachiya* [河内屋太助]. 4(Winter) [冬]:1–20.
- Gliem, David. 2008. Japonisme and Bonnard's invention of the modern poster. *Japan Studies Association Journal* 6:17–38.
- Günther, Albert Carl Ludwig Gotthilf. 1864. *The Reptiles of British India*. Robert Hardwicke, London. 452 p.
- Hearn, Patrick Lafcadio. 1894. *Glimpses of an Unfamiliar Japan (first series)*. Houghton Mifflin Company, New York, USA. 842 p.
- Higashi, Sumiko. 1994. *Cecil B. DeMille and American Culture: The Silent Era*. University of California Press, Berkeley. 264 p.
- Hughes, Edan Milton. 1986. *Artists in California, 1786–1940*. Hughes Pub. Co., San Francisco. 533 p.
- IDP. 2020. "Chinese Astronomy Resource: The Chinese Sky." The International Dunhuang Project. Accessed: December 11, 2020.
- Joly, Henri L. 1908. *Legend in Japanese Art: a description of historical episodes, legendary characters, folk-lore, myths, religious symbolism, illustrated in the arts of old Japan*. J. Lane Co., New York. 453 p.
- Kober, Marc. 2014. Pourquoi l'orientalisme d'Edward W. Said n'est-il pas un japonisme? *Sociétés & Représentations* 1(37):91–105.
- Laffan, W. Mackay. 1877. Canvas-back and Terrapin. *Scribner's Monthly* 15(1):1–13.
- Lambourne, Lionel. 2005. *Japonisme: cultural crossings between Japan and the West*. Phaidon Press Inc., New York. 240 p.
- Lovich, Jeffrey E. and Katsuya Yamamoto. 2016. Measuring the impact of invasive species on popular culture: A case study based on toy turtles from Japan. *Humans and Nature* 27: 1–11.
- Lovich, Jeffrey E., Yuichirou Yasukawa, and Hidetoshi Ota. 2011. *Mauremys reevesii* (Gray 1831)—Reeves' Turtle, Chinese Three-Keel Pond Turtle. 10 pp. In: Turtle Taxonomy Working Group [Rhodin, A.G.J., Iverson, J.B., Bour, R. Fritz, U., Georges, A., Shaffer, H.B., and van Dijk, P.P.]. 2017. Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (8th Ed.). In: Rhodin, A.G.J., Iverson, J.B., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Pritchard, P.C.H., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group.
- McAdams, Sara Elizabeth. 2016. *Turning Japanese: Japonisme in Victorian literature and culture*. PhD Dissertation. University of Michigan. 226 p.
- McAlister, Melani. 2005. *Epic Encounters: culture, media, and U.S. interests in the Middle East since 1945*. University of California Press, Berkeley. 407 p.
- Nott, Stanley Charles. 1946. *Chinese Culture in the Arts: being an illustrated descriptive record of the meaning of the emblematic and symbolic designs personified in the arts of China throughout the ages*. Chinese Culture Study Group of America, New York. 134 p.
- Ota, Hidetoshi, Yuichirou Yasukawa, Jinzhong Fu, and Tien-Hsi Chen. 2009. *Cuora flavomarginata* (Gray 1863)—Yellow-Margined Box Turtle. [includes *C. f. flavomarginata* and *C. f. evelynae*]. 10 pp. In: Turtle Taxonomy Working Group [Rhodin, A.G.J., Iverson, J.B., Bour, R. Fritz, U., Georges, A., Shaffer, H.B., and van Dijk, P.P.]. 2017. Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (8th Ed.). In: Rhodin, A.G.J., Iverson, J.B., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Pritchard, P.C.H., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group.
- PrintMag. 2009. Stereo Types. PrintMag.org. 17 June, 2009.
- Rosenblatt, Naomi. 2009. Orientalism in American Popular Culture. *Penn History Review* 16(2):51–63.
- Russell, Mary Doria. 1996. *The Sparrow*. Villard Books, New York. 408 p.
- Said, Edward. 1978. *Orientalism*. Pantheon Books, New York. 368 p.
- Scherr, Judith. 2007. "Pele deLappe, Artist and Activist, Remembered—1916–2007". *The Berkeley Daily Planet*. 16 October. Retrieved 2021-06-08.
- Seki, Keigo. 1966. Types of Japanese Folktales. *Asian Folklore Studies*. 25: 220 p.
- Sosnowski, Leszek. 2017. Objects and ideas. Japan and Europe in the nineteenth century. *Maska* 36:7–20.
- Standard Oil. 1915. Ye sign of ye white bear. Standard Oil Bulletin. *The Standard Oil Company (California)* 3(7):3–6.
- Stanford University. 2007. "Cigarettes Advertising Themes: Early Orientalist (Murad)." Research Into the Impact of Tobacco Advertising. Accessed: June 25, 2021.
- Stejneger, Leonhard. 1907. Herpetology of Japan and Adjacent Territory. *Bulletin of the United States National Museum, Smithsonian Institution*. Bulletin 58. Government Printing Office, Washington, DC. 577 p.
- Sunset. 1917a. "Demonstrating Lubrication" [advertisement]. *Sunset: the Pacific Monthly* 38(April):82.
- Sunset. 1917b. Ad-Letter Contest Awards for April. *Sunset: the Pacific Monthly* 38(June):5.
- Turtle Taxonomy Working Group [Rhodin, A.G.J., Iverson, J.B., Bour, R. Fritz, U., Georges, A., Shaffer, H.B., and van Dijk, P.P.]. 2017. Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (8th Ed.). In: Rhodin, A.G.J., Iverson, J.B., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Pritchard, P.C.H., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs 7:1–292. doi: 10.3854/crm.7.checklist.atlas.v8.2017.
- Wichmann, Siegfried. 2001. *The Japanese influence on Western art since 1858*. Thames & Hudson, New York. 432 p.
- Yasukawa, Yuichirou, Takashi Yabe, and Hidetoshi Ota. 2008. *Mauremys japonica* (Temminck and Schlegel 1835)—Japanese Pond Turtle. 6 pp. In: Turtle Taxonomy Working Group [Rhodin, A.G.J., Iverson, J.B., Bour, R. Fritz, U., Georges, A., Shaffer, H.B., and van Dijk, P.P.]. 2017. Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (8th Ed.). In: Rhodin, A.G.J., Iverson, J.B., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Pritchard, P.C.H., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group.

- Yasukawa, Yuichirou, Hidetoshi Ota, and John B. Iverson. 1996. Geographic Variation and Sexual Size Dimorphism in *Mauremys mutica* (Cantor, 1842) (Reptilia: Bataguridae), with Description of a New Subspecies from the Southern Ryukyus, Japan. *Zoological Science* 13(2):303–317.
 - Yasukawa, Yuichirou, Takashi Yabe, and Hidetoshi Ota. 2008. *Mauremys japonica* (Temminck and Schlegel 1835)—Japanese Pond Turtle. 6 pp. In: Turtle Taxonomy Working Group [Rhodin, A.G.J., Iverson, J.B., Bour, R. Fritz, U., Georges, A., Shaffer, H.B., and van Dijk, P.P.]. 2017. *Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status* (8th Ed.). In: Rhodin, A.G.J., Iverson, J.B., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Pritchard, P.C.H., and Mittermeier, R.A. (Eds.). *Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group*.
- We suggest the following format for citing this article:**
- Bettelheim, M. P. 2021. The Tortoise in the Temple: Orientalism, Japonisme, and the Exploitation of Asian Turtle Mystique in Western Popular Imagination. *Bibliotheca Herpetologica* 15(13):128–140.

Tortue-à-Porter: The Faux Fashion Fad of Turtle Attire

Matthew P. Bettelheim

5500 Pennsylvania Blvd, Concord, California 94521 USA, blackfish@nasw.org

One hundred years ago this year, French journalist, writer, and painter Georges-Armand Masson published an otherwise unassuming article in the French fashion journal *Gazette du Bon Ton* titled “*tortues*” (turtles) (Masson 1921). Therein, Masson effused about his years as a “*chasseur de tortues*” (turtle hunter) in Africa on the upper Zambezi River. Turtles, Masson explains, are “*aimables insectes*” (loveable insects) and debatably “*une variété équatoriale de la coccinelle*” (an equatorial variety of the ladybug).

To catch said turtles, Masson offered several methods: “*en les tirant à la carabine; en les attrapant au lasso; en les chatouillant sous le ventre avec une plume d’oie; ou encore en leur proposant des énigmes*” (by shooting them with rifles; by catching them with a lasso; by tickling them under the belly with a quill pen; or even by offering them puzzles to solve).

And then, for readers still none the wiser, Masson explained how turtles lose their teeth (and require dentures) at a young age. And molt their shells. And how turtle shells can be fashioned into cameos, baptismal fonts, and “*une élégante toque de demi saison*” (an elegant half-season hat).

Masson’s “*tortues*” was not a travelogue but rather a sparkling example of the *Gazette du Bon Ton*’s irreverent whimsy that made this up-and-coming fashion rag nonpareil. The *tortue* was just another prop in a “Shaggy Dog”¹ faux fashion story that, aside from a mention by Long (2009), appears to have left little lasting impressions in the fashion world.

In the full text of Masson’s purple prose penned tongue-in-cheek for *Gazette du Bon Ton*, the tall tale (translated from the original French to English) reads in full (Fig. 1):

A long time ago when I was a turtle hunter on the upper Zambezi, I had plenty of time to study the psychology of these lovable insects, as well as their customs and institutions. Naturalists are debating whether the turtle is a shell, or an equatorial variety of the ladybug or “beast of our Lord.” This last hypothesis seems to me the most scientific one. Seeing it moving forward without leaving its shield in any instance, which is more historiated than that of Achilles, one might think that it has a bellicose complexion, like its cousin the land snail, whose horns are so murderous. It is not: it is the most harmless being on Earth. Its gentleness even borders on timidity: at the approach of the enemy, it hides its head under the wing like an ostrich; the ostrich is actually just

one kind of feathered turtle, but without a shell, and provided with long stilts as well as a giraffe neck; the giraffe is in fact nothing other than... but let us come back to our turtles.

Turtles are hunted in several ways: by shooting them with rifles; by catching them with a lasso; by tickling them under the belly with a quill pen; or even by offering them puzzles to solve. They can then be tamed without difficulty. If nature did not oblige them to carry their house on their back, turtles would replace advantageously, for the race or work, the mule and even the draft horse. I have made many trips to Transvaal on the back of turtles which I still vividly remember because the amble of my mount, soft and regular, allowed me plenty of time to admire the scenery.

The turtle loses its teeth very young, which forces it to constantly carry dentures, and to feed itself exclusively on radishes and watercress; these foods, rich in vitamins, impart a delicious flavor to its flesh: cut into small pieces and mixed with parsley, one can cook excellent Burgundy snails.

Like snakes, turtles are prone to periodic molting. They then turn into cigarette holders. Dislodged from their shells before the time of this molt, we can keep their shells intact and make either baths or baptismal fonts. There is no limit to the use of this helpful reptile: eyewear, jewelry, brush making are dependent on the turtle, which provides them easily with the scale necessary for making parasol sleeves, eye glasses, and fans. It remained to imagine making hats out of them. It’s done. The shell of a medium turtle, embellished with a bunch of ribbons, provides an elegant half-season hat. If we tie it at the chin with a few straps, we still have a very attractive morning cap. Small milk-fed turtles can be worn as cameos.

Parisian ladies are right to adopt the turtle as their favorite animal. The pelican, last year’s fashion, had the nasty habit to pierce its side, which is a messy habit. As for the elephant that Hindustan popularized, it is quite simply ridiculous, with its curled leather pants, and its trunk looking like a tail that has taken the wrong place. The turtle, on the contrary, is a true symbol. The turtle is optimism; it is the image of the easygoing and peaceful, of life savored in small steps. It is the revenge of the home-sweet-home spirit on the genius of the adventure. We are astonished enough that the Woman, for whom a life without passion is like a plane without an engine, falls in love with the ideal, very new to her, of which the turtle is the sign. Should we see in this choice the index of a psychological revolution? And who knows if some Buffon, later, will not say: “The noblest conquest of women, is the turtle.”

Georges-Armand MASSON (Masson 1921)

¹A shaggy dog story or yarn is an extremely long-winded anecdote characterized by extensive narration of typically irrelevant incidents and terminated by an anticlimax.

The *Gazette du Bon Ton* (Journal of Good Taste) was a small monthly fashion magazine published in France between 1912 and 1925 by fashion publisher Lucien Vogel. Catering to the sophisticated Parisian, its prestige and elitism were reflected in the annual subscription price of 100 francs, which roughly equates to \$4 US per issue in 1921 or \$60 US per issue today (Davis 2006). During its run, the *Gazette du Bon Ton* published sixty-nine issues. Aside from a pause in publication during World War I, 10 issues were published each year (with the exception of January and August) (Hopkins 1989). In the early 1920s, the *Gazette du Bon Ton* was published and later purchased by Condé Nast before Lucien and Nast retired the short-lived publication in 1925 to concentrate on *VOGUE* magazine (Rozyn 2017).

The *Gazette du Bon Ton* distinguished itself as a luxury publication that was influential and innovative—in short, “a fashion publication [elevated] to a complete work of art” (Hopkins 1989). In addition to featuring fashions that could be found nowhere else (due to their exclusive contracts with Paris’ top couture houses), the *Gazette du Bon Ton* cultivated a “literary cachet” of articles that were, among other things, “witty... irreverent... somewhat mocking and ironic” paired with “whimsical and one-of-a-kind illustrations.” The running text—but especially the captions—and illustrations were ripe with double entendre and word play that employed simple yet urbane wit through puns, allusions, and homophones, to name a few (Davis 2006).

At the heart of each issue of *Gazette du Bon Ton* were a set of unbound fashion plates—ten full-page illustrations produced as bright, hand-colored *pochoir* prints in single folio sheets (Davis 2006), a labor intensive technique involving colored pencil stencils with watercolor (Rozyn 2017). The *Gazette du Bon Ton*’s prestige was reinforced by the choice of strong and durable—but most importantly, luxurious—fine handmade laid vellum, or *papier vergé*, upon which the periodical was printed (Hopkins 1989). Altogether, each issue measured approximately eight inches in width, ten inches in length, and close to an inch thick (Pilgrim 1999).

The whimsical illustrations that accompanied Masson’s “*tortue*” were drawn by French artist and illustrator Charles Martin (1884–1934). Martin’s repertoire included work as a graphic artist, posterist, fashion designer, and ballet and theater set and costume designer. In addition to his contributions to the journals *Gazette du Bon Ton*, *Modes et Manières d’Aujourd’hui*, *Journal Des Dames et Des Modes*, *Vogue*, *Harper’s Bazaar*, and *Vanity Fair*, Martin illustrated French composer Erik Satie’s humoristic piano suite *Sports et Divertissements* (1919), the erotic masterpiece *Mascarades et Amusettes* (1920), and the fashionable hat catalogue *Les Modes en 1912*. Martin was among the elite stable of *Gazette du Bon Ton* “dandified” avant-garde artists nicknamed the “Beau Brummels of the Brush” who had been recruited by Lucien Vogel himself (Davis 2006).

Little is known about Georges-Armand Masson (1892–1977), the brains behind the titular “*tortues*,” aside from being

a painter and his authorship of several humor books, among them *Chorceaux moisis—L’Histoire farfelue de la genèse aux temps modernes* (Moldy Chorceaux—the Far-Fetched Story from Genesis to Modern Times) (1959) and *L’Amour de “Ah” jusqu’à “Zut !”* (Love from “Ah” to “Damn!”) (1960). Nevertheless, with the limited knowledge that Masson was a humor writer and that whimsy, double entendre, and word play were the *Gazette du Bon Ton*’s bread-and-butter, examples of such urbane wit can be deciphered in this turtle-fashion hit piece written in post-Napoleonic France.

For example, the phrase “*Le pélican de l’an passé avait le tort de se percer le flanc, ce qui est une habitude malpropre*” can be translated to read, “The pelican, last year’s fashion, had the nasty habit to pierce its side.” The allusion is either oblique or suggestively absurdist without the proper context. In medieval Europe, the pelican was believed to symbolize Christ’s sacrificial death. This symbolism stemmed from a belief that when baby pelicans violently flapped their wings, their father would kill them out of fear, and then their mother would pierce her breast and revive her dead babies with her blood. Over time, this idea was simplified and later recounted as a belief that pelicans pierced their breasts with their beaks to feed blood to their young (Neilson et al. 1939, Biedermann 1992, Apostolos-Cappadona 1994).

For those few readers not yet in on Masson’s overall joke, or for those readers otherwise onboard and enjoying the ride, this biblical reference would have been another twist in his irrelevant narrative and another twist of the knife to drive home the preposterousness of certain fashion trends.

There may have been another more subversive humor at play with *Gazette du Bon Ton*’s “*tortues*” trend. In France ca. 1872, a white turban studded with three concentric circles of beads, such as might be worn by a “Moor” (e.g., Muslims and Arabs), was known as a *tortil* (Larousse 1872). In 1910, French fashion designer Paul Poiret found new millinery inspiration after a visit to the Victoria and Albert Museum in London’s collection of Indian turbans. By the time Masson published “*tortues*” in 1921, Poiret, who held an exclusive contract with Vogel (Davis 2006), had successfully ignited the fashion world’s interest in the turban (Park and Cho 1997) (Fig. 2). When it comes to head-ware, the turban and the turtle shell both share similar sleek, curvilinear profiles, which would have made this play on words a visual pun as well. Especially if the turban was adorned with a front-“facing” knot or an ornamental jewel as a centerpiece, the resemblance of staring down a turtle head-on would not be easily overlooked, as exemplified for example by Georges Lepape’s untitled illustration of a woman in a turban (Fig. 3).

Masson closes the article with a speculative quote by a “Buffon” in which this person conjectures at some later date, “*La plus noble conquête de la femme, c’est la tortue*” (“The noblest conquest of women, is the turtle”). French naturalist Georges-Louis Leclerc, a.k.a. the Comte de Buffon, may not have had much to say in his life about turtles or fashion per se, but he did once write of the horse, “*La plus noble*



tortues

AU temps où j'étais chasseur de tortues sur le Haut-Zambèze, j'eus tout loisir d'étudier la psychologie de ces aimables insectes, ainsi que leurs coutumes et institutions. Les naturalistes balancent sur le point de savoir si la tortue est un coquillage, ou bien une variété équatoriale de la coccinelle ou « bête à bon Dieu ». Cette dernière hypothèse me paraît la plus scientifique. A la voir se promener sans

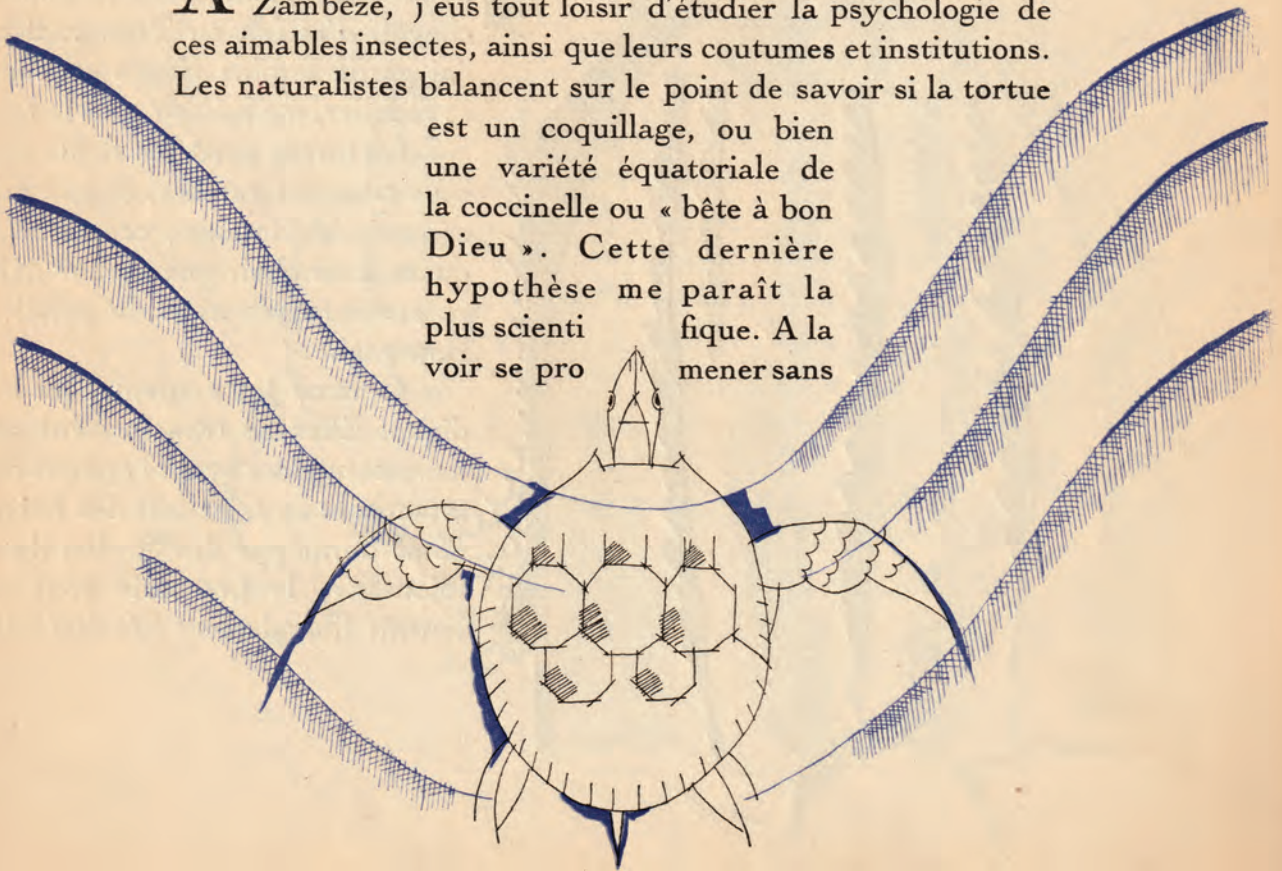


Fig. 1a. Page 153 of the satirical article “tortues” (turtles) by French journalist, writer, and painter Georges-Armand Masson first appeared in volume 6 of the 1921 French fashion journal *Gazette du Bon Ton* one hundred years ago this year with illustrations by French artist and illustrator Charles Martin (Masson 1921).



quitter un instant son bouclier pl
pourrait la croire d'une complexion
colimaçon, dont les cornes sont si
l'être le plus inoffensif de la ter
timidité : à l'approche de l'ennemi,
manière de l'autruche ; l'autruche
tortue à plumes, mais sans carapa
ainsi que d'un cou de girafe ;
revenons à nos tortues.

On chasse les tortues de pl
carabine ; en les attrapant au lass
avec une plume d'oie ; ou encor
Elles se laissent ensuite apprivoise
obligeait à porter leur maison sur
avantageusement, pour la course
cheval. J'ai fait au Transvaal ma
j'ai gardé le plus vivace souvenir,
et régulier, me laissait tout le temp

La tortue perd ses dents fort
sans cesse un ratelier, et à se nour
cresson de fontaine ; ces aliments
quent à sa chair une saveur délici
et accommodée avec du persil, o
Bourgogne.

Comme les serpents, les tort
dique. Elles se transforment alor
leurs carapaces avant l'époque de c
intactes et en faire soit des baigno
ne se borne pas l'utilisation de ce
bijouterie, la broserie sont tri
fournit libéralement l'écaille néce

Fig. 1b. Page 154 of the satirical article “*tortues*” (turtles) by French journalist, writer, and painter Georges-Armand Masson first appeared in volume 6 of the 1921 French fashion journal *Gazette du Bon Ton* one hundred years ago this year with illustrations by French artist and illustrator Charles Martin (Masson 1921).

us historié que celui d'Achille, on
a belliqueuse, comme son cousin le
meurtrières. Il n'en est rien : c'est
re. Sa douceur confine même à la
elle se cache la tête sous l'aile à la
à vrai dire n'est qu'une sorte de
ace, et munie de longues échasses
la girafe n'est d'ailleurs... Mais

usieurs façons : en les tirant à la
; en les chatouillant sous le ventre
e en leur proposant des énigmes.
r sans difficulté. Si la nature ne les
leur dos, les tortues remplaceraient
ou le trait, le mulet et même le
ints voyages à dos de tortue dont
car l'amble de ma monture, doux
s d'admirer le paysage.

jeune, ce qui la contraint à porter
rir exclusivement de radis et de
, riches en vitamines, communi-
euse : débitée en petits morceaux
n en fait d'excellents escargots de

ues sont sujettes à une mue périodique
s en fume-cigarettes. Délogées de
ette mue, on peut conserver celles-ci
ires, soit des fonts baptismaux. Là
serviable reptile : la lunetterie, la
butaires de la tortue, qui leur
ssaire à la confection des manches

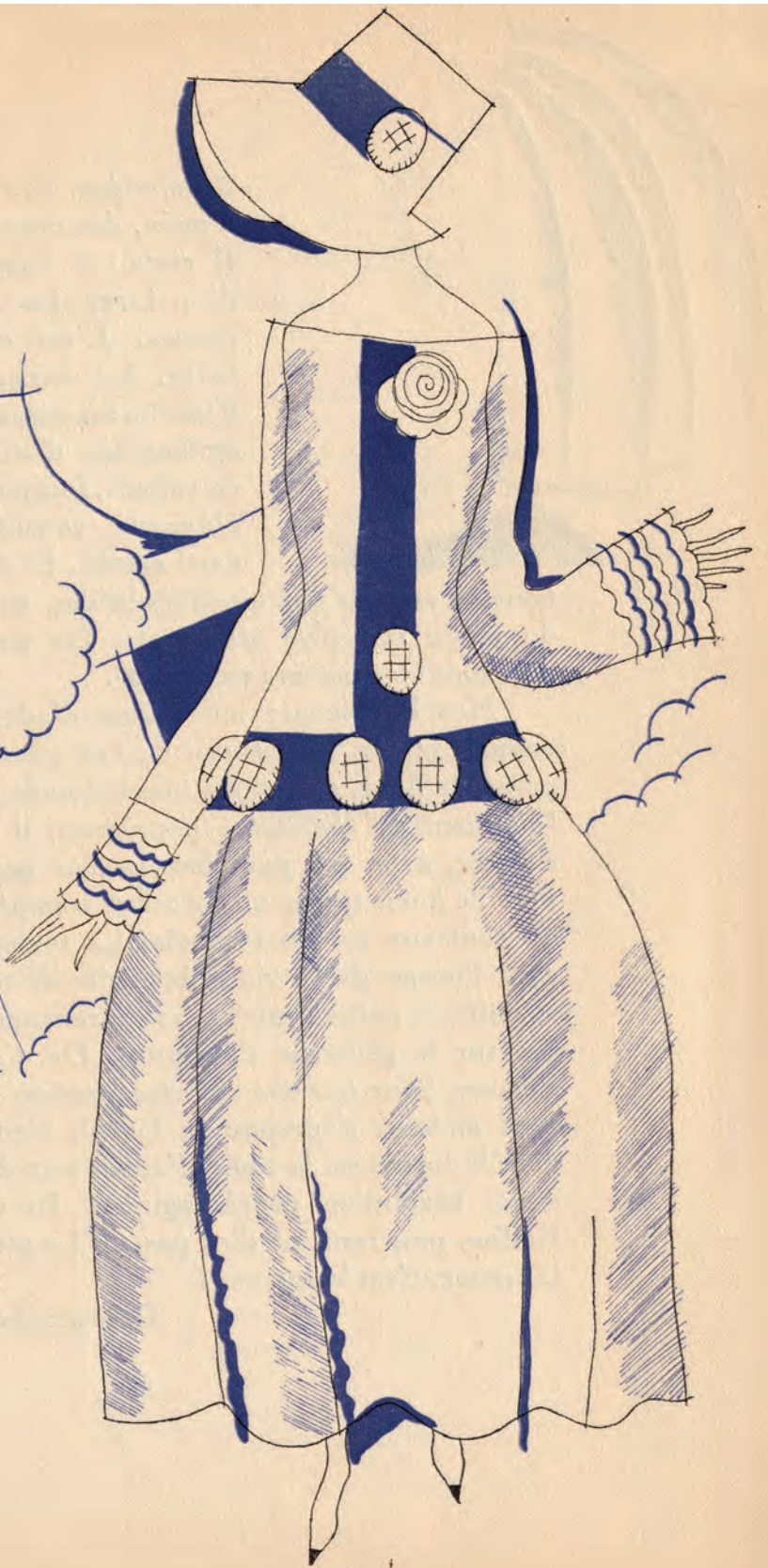


Fig. 1c. Page 155 of the satirical article “*tortues*” (turtles) by French journalist, writer, and painter Georges-Armand Masson first appeared in volume 6 of the 1921 French fashion journal *Gazette du Bon Ton* one hundred years ago this year with illustrations by French artist and illustrator Charles Martin (Masson 1921).



d'ombrelles, des face
à main, des éventails.
Il restait à imaginer
d'en faire des cha-
peaux. C'est chose
faite. La carapace
d'une tortue moyenne,
agrémentée d'un flot
de rubans, fournit une
élégante toque de
demi saison. Si on la



noie au menton par quelques brides, on a encore un bonnet
du matin des plus séduisants. De petites tortues de lait
pourront être portées en camées.

Nos Parisiennes ont raison d'adopter la tortue pour
animal fétiche. Le pélican de l'an passé avait le tort de se
percer le flanc, ce qui est une habitude malpropre. Quant à
l'éléphant qu'*Hindoustan* popularisa, il est tout simplement
ridicule, avec son pantalon de cuir gondolé, et sa trompe,
pareille à une queue qui se serait trompée de place. La tortue
au contraire est un symbole. La tortue, c'est l'optimisme ;
c'est l'image de la vie débonnaire et train train, de la vie
savourée à petits coups. C'est la revanche de l'esprit pot-au-
feu sur le génie de l'aventure. On s'étonne assez que la
Femme, pour qui une vie sans passion est comme un avion
sans moteur, s'éprenne de l'idéal, bien nouveau pour elle,
dont la tortue est le signe. Faut-il voir dans ce choix l'indice
d'une révolution psychologique ? Et qui sait si quelque
Buffon, plus tard, ne dira pas : « La plus noble conquête de
la femme, c'est la tortue. »

Georges-Armand MASSON.

Fig. 1d. Page 156 of the satirical article "tortues" (turtles) by French journalist, writer, and painter Georges-Armand Masson first appeared in volume 6 of the 1921 French fashion journal *Gazette du Bon Ton* one hundred years ago this year with illustrations by French artist and illustrator Charles Martin (Masson 1921).



Fig. 2. A collage of 20th century fashion illustrations depicting the popularity of the turban as a fashion statement. **Top Right:** *Robes-Coiffures et Manteaux a Capuchons* (Hairstyle Dresses and Hooded Coats) by Martha Romme (*Gazette du Bon Ton*, 1920, volume 1, page 29) (Romme 1920); **Right Center:** *Psychologie de la Parure* (Psychology of Adornment) by Eduardo Benito (*Gazette du Bon Ton*, 1920, volume 4, page 109) (Benito 1920); **Bottom Right:** *L'e Madras Jaune – Coiffure pour le soir* (The Yellow Madras – Hairstyle for the Evening) by Charles Martin (*Gazette du Bon Ton*, 1920, volume 1, Plate I) (Martin 1920); **Bottom Left:** *Lassitude* by Georges Lepape (*Gazette de Bon Ton*, 1912, volume 1, Plate VIII) (Lepape 1912); **Top Left:** *La Cape Ecosaise – Cape pour la théâtre* (The Scottish Cape – Cape for the theater) by Garcia Calderon (*Gazette du Bon Ton*, 1914, volume 4, Plate 32) (Calderon 1914).

conquête que l'homme ait jamais faite est celle de ce fier et fougueux animal qui partage avec lui les fatigues de la guerre et la gloire des combats" (The noblest conquest that man has ever made is that of this proud and fiery animal who shares with him the fatigue of war and the glory of combat...)

(Buffon 1888). This passage is misremembered today—or, more precisely, has been misquoted—to say “The noblest conquest of man is that of the horse.”

The reference to Buffon is clearly imperfect. However, another witticism in circulation at the time brings us closer: “*Le cheval est la plus noble conquête de l'homme; la femme est la plus noble conquête du cheval*” (The horse is the noblest conquest of man; the woman is the noblest conquest of the horse) (Montorgueil 1896). French poet and playwright Alfred Jarry continued to play with this quip through another permutation: “*La plus noble conquête du cheval, c'est la femme*” (“The noblest conquest of the horse, is women”) (Chatenay 1903, Jarry 1911), suggesting at long last that Masson’s “quote” may have been an amalgamation of Buffon (1888) and Jarry (1911).

But that’s not all. Masson’s decision to speculatively attribute Buffon rather than Jarry may not have been accidental. His word choice—“some Buffon” rather than simply “Buffon” or “the Comte de Buffon”—may have been a knowing nod to its near-homonym cognate “buffoon,” suggesting that only some fool or some idiot might make such an observation that the height of women’s accomplishments was accepting the turtle into couture.

Despite all of this tomfoolery, Masson may have also inadvertently backed into a truth or two along the way. It has been well documented that tortoise shell has long been used to make combs and bracelets dating back to pre-dynastic Egypt (3500–3100 BC), and on a more commercial scale in Europe for furniture inlays, eyeglass frames, and jewelry (to name a few) as early as the 15th century (Hain-schwang and Leggio 2006). But unbeknownst to Masson (or, presumably so), his sly suggestion that a turtle shell embellished with ribbons makes for an elegant half-season hat had already been realized some eighty years earlier when Reverend Thomas Heath collected a “tortoise shell Bonnet” from the Navigators’ Islands (present-day Samoa) between 1836 and 1840 and presented it to Queen Victoria in 1841. The bonnet (Fig. 4)—crafted in the style of the hood-shaped ‘poke bonnet’ or

‘coal scuttle bonnet’ popular in Victorian England during the 1830s—had been manufactured by a Samoan woman post-missionary/European colonizer contact. This one-of-a-kind artifact, which remains to this day in the collections of the British Museum [Oc1841,0211.12], is constructed with large



Fig. 3. French artist and fashion designer Georges Lepape's untitled (woman in turban) (Plate 6) print from *Les choses de Paul Poiret vues par Georges Lepape* (1911). Viewed head-on, the sleek, curvilinear profile of a turban paired with an ornamental knot, jewel, or brooch bear a close resemblance to a turtle emerging from its shell. The likeness of the two may have been Masson's inspiration for the play on words and visual puns at the heart of "*tortues*" (Lepape 1911).

carapacial plates of what appear to be a Hawksbill Sea Turtle (*Eretmochelys imbricata*) that have been molded into shape and stitched in place with organic sennit cordage (vegetable-fibre thread), and then trimmed with European printed cotton cloth (Cummings 2017).

Curiously enough, Cummings argues that the mimicry implied by this bonnet that melds two unique cultures does not represent "an inbetween object that merely embodies exchange or transformation as the inevitable result of [first encounters]," but rather a defiance that can be interpreted in terms of mockery, menace, and "a form of subterfuge that challenged the authority of the missionary intervention in Samoa" (Cummings 2017). In other words, even this bonnet—probably a one-off—that Masson referenced by coincidence was also crafted with its own secret language of mockery, irony, and hidden meaning.

By dusting off Masson's *tortue-à-porter* treatise, we can ensure that this quaint piece of improbable history's humor is not lost on us a century later. Rather, readers can take on the challenge of rereading Masson's tongue-in-cheek text with a fine tooth tortoise-shell comb in search of additional Easter eggs that remain unaccounted for.



Fig. 4. This "tortoise shell Bonnet" was collected by Reverend Thomas Heath from the Navigators' Islands (present-day Samoa) between 1836 and 1840 and presented to Queen Victoria in 1841. The bonnet is composed of large carapacial plates of what appear to be a Hawksbill Sea Turtle (*Eretmochelys imbricata*) stitched with organic sennit cordage (vegetable-fibre thread) and trimmed with European printed cotton cloth. Hood-shaped bonnet's such as these were known as a 'poke bonnet' or 'coal scuttle bonnet' and were popular in Victorian England during the 1830s (Cummings 2017). (Courtesy of the British Museum © The Trustees of the British Museum, released as CC BY-NC-SA 4.0)

AUTHOR'S NOTE

For those readers interested in learning more about—or simply browsing—the *Gazette du Bon Ton*, the following institutions have graciously digitized their holdings:

Smithsonian Libraries:

<https://library.si.edu/digital-library/author/vogel-lucien>

Digital Commons @ Rhode Island School of Design (RISD):

https://digitalcommons.risd.edu/specialcollections_periodicals_gazzettedubonton/

Internet Archive:

<https://archive.org/search.php?query=gazette%20du%20bon%20ton>

Bibliothèque nationale de France:

<https://gallica.bnf.fr/ark:/12148/cb32781018t/date&rk=21459;2>

ACKNOWLEDGEMENTS

Special thanks to Patrick David for translation assistance from the original French, and Sarah Anne Bettelheim for reviewing drafts of this manuscript.

REFERENCES

- Apostolos-Cappadona, Diane. 1994. *Dictionary of Christian Art*. Continuum Publishing Company, New York, New York, USA. 376 p.
- Benito, Eduardo (artist). 1920. Psychologie de la Parure. *Gazette du Bon Ton: Arts, Modes, et Frivolites* 4:109.
- Biedermann, Hans. 1992. *Dictionary of Symbolism—Cultural Icons and the Meanings Behind Them*. Facts on File, New York, New York, USA. 465 p.
- Buffon, Georges-Louis Leclerc. 1888. *Histoire Naturelle des Animaux. Les Animaux Domestiques*. Le Cheval. H. Lecène et H. Oudin, Éditeurs, Paris, France. 320 p.
- Calderon, Garcia (artist). 1914. La Cape Ecossaise – Cape pour la théâtre. *Gazette du Bon Ton: Arts, Modes, et Frivolites* 4:Plate 32.
- Chatenay, Edmond (Ed.). 1903. Pensées Hippiques. *Le Canard Sauvage*. 1(2):3.
- Cummings, Catherine. 2017. Queen Victoria's Samoan Bonnet. Pp. 190–208 In: Paul Basu (Ed.) *The Inbetweenness of Things: Materializing Mediation and Movement Between Worlds*. Bloomsbury Academic, New York, USA.
- Davis, Mary E. 2006. *Classic Chic: Music, Fashion, and Modernism*. University of California Press, Berkeley, USA. 332 p.
- Hainschwang, Thomas and Laurence Leggio. 2006. The Characterization of Tortoise Shell and its Imitations. *Gems and Geology* 42(1): 36–52.
- Hopkins, Michele L. 2018. *Gazette du Bon Ton: Reconsidering the Materiality of the Fashion Publication*. Thesis. The George Washington University.
- Jarry, Alfred. 1911. *Gestes et Opinions du Docteur Faustroll Pataphysicien: roman néo-scientifique, suivi de spéculations*. E. Fasquelle, Paris. 323 p.
- Larousse, Pierre. 1872. «tortil»; «flânerie». *Grand dictionnaire universel du XIXe siècle: français, historique, géographique, mythologique, bibliographique, littéraire, artistique, scientifique, etc., etc. Tome 15 (TESTAM-Z)*. Administratino du Grand Dictionnaire Universel. p 322.
- Lepape, Georges. 1911. *Les Choses de Paul Poiret: vues par Georges Lepape*. Pour Paul Poiret par Maquet, Paris, France. 72 p.
- Lepape, Georges (artist). 1912. Lassitude. *Gazette du Bon Ton: Arts, Modes, et Frivolites* 1:Plate VIII.
- Long, Julia. 2009. Portable Pets: Live and Apparently Live Animals in Fashion, 1880–1925. *Costume* 43(1):109–126.
- Martin, Charles (artist). 1920. L'e Madras Jaune – Coiffure pour le soir. R. *Gazette du Bon Ton: Arts, Modes, et Frivolites* 1:Plate 1.
- Masson, Georges-Armand. 1921. Tortues. *Gazette du Bon Ton: Arts, Modes, et Frivolites* 6:153–156.
- Masson, Georges-Armand. 1959. *Chorceaux moisés – L'Histoire farfelue de la genèse aux temps modernes*. Stock, Paris, France. 252 p.
- Masson, Georges-Armand. 1960. *L'Amour de "Ah" jusqu'à "Zut!"*. Stock, Paris, France. 252 p.
- Montorgueil, Georges. 1896. *Les Parisiennes D'a Présent*. L'Année Féminine. H. Floury. 133 p.
- Neilson, W.A., T.A. Knott, and P.W. Carhart (Eds). 1939. «pelican». *Webster's New International Dictionary of the English Language (2nd ed.)*. G. & C. Merriam Company, Publishers, Springfield, MA., USA.
- Park, Hye Won and Kyu Hwa Cho. 1997. A Study of the Oriental Influences on Poiret's Designs. *Journal of Fashion Business* 1(2):74–85.
- Pilgrim, Linda Kathryn. 1999. *La Gazette du Bon Ton: Arts, Modes, and Frivolites: an Analysis of Fashion and Modernity Through the Lens of a French Journal de Luxe*. Thesis. University of Southern California, Los Angeles, California.
- Romme, Martha (artist). 1920. Robes-Coiffures et Manteaux a Capuchons. *Gazette du Bon Ton: Arts, Modes, et Frivolites* 1:29–30.
- Rozyn, Karl (curator). 2017. *Vintage Vision: The Art of Gazette du Bon Ton*. Cornell University Library Online Exhibitions. Cornell University Library, Ithaca, New York.

We suggest the following format for citing this article:

Bettelheim, M. P. 2021. Tortue-à-Porter: The Faux Fashion Fad of Turtle Attire. *Bibliotheca Herpetologica* 15(14):141–149.



International Society for the History and Bibliography of Herpetology

Bibliotheca Herpetologica Vol. 15

Formerly the *International Society for the History and Bibliography
of Herpetology Newsletter and Bulletin*

Contents

From the Chairman	i
From the Editor	i
About the Cover	i

Articles

Savage, J. M. — The Herpetological Contributions of Christiaan Karel Hoffmann (1844–1903) in H. G. Bronn's <i>Klassen und Ordnungen des Thier-Reichs</i> , with Remarks on his Treatment of the Family-Group Names of Constant Duméril, Gabriel Bibron, and Auguste Duméril.	1
Bettelheim, M. P. — Rotgut and Rattlesnakes— A Brief History of “Snake Bite” Whiskey.	14
Shea, G. M. — Dr. John Mair, Captain Collet Barker, and the discovery of the Australian Keelback, <i>Tropidonophis mairii</i> (Serpentes, Colubridae).	18
Hilton, E. J. — Book Review. The Lost Species: Great Expeditions in the Collections of Natural History Museums. ...	29
Santos, B. S. and L. M. P. Ceríaco — Francisco Newton's Zoological Expedition to Angola (1903–1906): Review of a forgotten expedition.	31
Murphy, J. C. and M. D. Cardwell — Avoiding Envenomation While Dancing with Rattlesnakes, the Hopi Snake Ritual and Tobacco.	46
Jacobs, H. J. and A. Koch — On the Discovery and Scientific Description of the Emerald Tree Monitor, <i>Varanus prasinus</i> (Schlegel, 1839).	61
Dodd, C. K. Jr. and M. R. Jennings — How to Raise a Bullfrog—The Literature on Frog Farming in North America. ...	77
Honegger, R. E. — The frogs of Christoph Froschauer (ca. 1490–1564), the first printer of Zurich.	101
Savage, J. M. and B. I. Crother — The snakes of Dante's <i>Inferno</i> and Lucanus' <i>de Bello Civili</i> (<i>Pharsalia</i>).	106
Dodd, C. K. — Book Review. The Last Turtlemen of the Caribbean. Waterscapes of Labor, Conservation, and Boundary Making.	113
Ananjeva, N. B. and I. V. Doronin — Herpetological century: 100 th Anniversary of the Division of Herpetology, the Zoological Institute of the Russian Academy of Sciences, St. Petersburg.	118
Bettelheim, M. P. — The Tortoise in the Temple: Orientalism, Japonisme, and the Exploitation of Asian Turtle Mystique in Western Popular Imagination.	128
Bettelheim, M. P. — Tortue-à-Porter: The Faux Fashion Fad of Turtle Attire.	141